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A CLINICAL STUDY OF DIPHTHERIA.

2093 CASES TREATED BY THE WRITER AT THE BOSTON CITY HOSPITAL.

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Diphtheria properly treated with antitoxin presents a clinical picture very different from that of the text-books of three or four years ago. From being the most fatal of the acute infectious diseases, with a death-rate of from 30 to 50[1] per cent., its mortality has been lowered to such an extent that it is now but a little more important factor in the total death-rate of Boston than typhoid fever.[2]

The death-rate from diphtheria in Boston for fifteen years previous to 1894 and before the use of antitoxin was 30.8 per cent.;[3] the death-rate from the same disease in Berlin for four years previous to 1895 and before the use of antitoxin was 35.3 per cent.;[4] and the hospital death-rate for the United States and Europe was about 46 per cent.[5]

In the Emperor and Empress Frederick's Children's Hospital at Berlin during three years previous to 1894, 1081 cases of diphtheria were treated without antitoxin, with a death-rate of 38.9 per cent.;[6] in the Children's Hospital of Paris during four years previous to 1894, 3971 cases of diphtheria were treated without antitoxin, with a death-rate of 51.7 per cent.;[7] and in the Boston City Hospital during four years and one month previous to February 1, 1894, 1421 cases of diphtheria were treated without antitoxin, with a death-rate of 45.3 per cent.—that is to say, during the four years immediately preceding the

advent of antitoxin 6473 cases of diphtheria were treated in the large hospitals of Berlin, Paris, and Boston, of whom 3117 died.

In 1894 the antitoxin treatment was begun. Roux and his colleagues at the Pasteur Institute had been studying the toxin of diphtheria, and had succeeded in isolating a poison of great potency. They had been able to immunize animals and had proven that the serum of such immunized animals possessed the power of protecting other animals against this poison and of stopping the morbid processes in those animals in which diphtheria had been experimentally produced. The experimental work was so convincing that on February 1, 1894, the treatment of the patients in the diphtheria wards of the Hôpital des Enfants Malades with this serum was begun. The treatment was a success from the first. The death-rate in this hospital for the first six months of the antitoxin treatment was less than half what it had been during the three years immediately preceding its use.[8] The promise given by this first trial has been fulfilled, and the death-rate from diphtheria has been greatly reduced wherever antitoxin is used. The latest health reports show that the death-rate from diphtheria in London is 15.3 per cent.;[9] in Philadelphia 20.4 per cent.;[10] in Milwaukee 17.7 per cent.;[11] in St. Louis 16.4 per cent.;[12] and in Boston 9.7 per cent.[13] Also that the total number of deaths from diphtheria in Berlin during 1899 was 609, whereas the annual average number of deaths from diphtheria for five years previous to the use of antitoxin was 1318;[14] and that the total number of deaths from diphtheria in Paris during 1899 was 336, whereas the annual average number of deaths from diphtheria in that city for five years before the use of antitoxin was 1514.[15]

The present contagious department of the Boston City Hospital was opened in 1895, and is under the able direction of Dr. John H. McCollum. Antitoxin has been used here from the first; and the death-rate has been low, and has decreased with each succeeding year. It was my good fortune to serve as clinical assistant to Dr. McCollum for two years, from August, 1898, until August, 1900. During my second year with Dr. McCollum, or from August 7, 1899, until August 6, 1900, I had charge of the medical treatment of the patients in the diphtheria wards. We were assisted by a competent staff of house officers, but I personally saw each patient daily, and during the acute period of the disease repeatedly during each day; and ordered all antitoxin that was given, and carefully watched the progress of the disease in each and every case. During these twelve months 2093 cases of unmistakable diphtheria were admitted to the wards. Of this number 131 proved to have a mixed infection and 1962 were uncomplicated. For the present we will consider only the 1962 uncomplicated cases. Of this number 240 died, giving a death-rate of 12.23 per cent. But

of the 240 fatal cases 69 were moribund and died within twenty-four hours of admission. If we deduct these as being too far advanced in the disease to respond to treatment, we have a modified death-rate of 9 per cent. This remarkably low death-rate is due to the use of antitoxin in sufficient quantities to counteract the diphtheria poison. The cases as a rule were severe, as the cases sent to hospitals usually are; and the health reports show that there was a severe epidemic of diphtheria in Boston during the winter of 1899 and 1900.

Age and Sex. Of the 1962 uncomplicated cases 947 were males and 1015 were females. There was no appreciable difference in the death-rate of the sexes. There were 1647 patients less than fifteen years of age, and 315 patients over that age. The death-rate for those under fifteen years of age was 14 per cent., and for those above that age it was 2.85 per cent. The youngest patient treated was an infant boy, aged six weeks, who recovered; and the oldest was a woman, aged sixty-eight years, who was very ill, was given 44,000 units of antitoxin, and also recovered.

The accompanying table (Table I.) shows the distribution by age and by sex, and also the deaths for each year of life, of the sexes separately, and in total with the mortality percentages for each:

Table I.

Table of 1962 cases of diphtheria showing the distribution by age and by sex, with the deaths by sex and in total, for each year of life, and the mortality percentages.

Ages in years.	Males.			Females.			Totals.		
	Cases.	Deaths.	Per ct.	Cases.	Deaths.	Per ct.	Cases.	Deaths.	Per ct.
0 to 1	25	9	36.00	22	10	45.45	47	19	40.40
1 " 2	55	21	38.18	63	19	30.15	118	40	33.90
2 " 3	87	18	20.69	82	21	25.60	169	39	23.00
3 " 4	129	20	15.50	95	15	15.79	224	35	15.60
4 " 5	106	12	11.32	106	19	17.92	212	31	14.60
5 " 6	86	14	16.27	108	10	9.25	194	24	12.30
6 " 7	77	6	7.79	95	12	12.63	172	18	10.04
7 " 8	65	6	9.23	63	5	7.93	128	11	8.60
8 " 9	56	1	1.78	40	1	2.50	96	2	2.08
9 " 10	48	2	4.17	48	4	8.33	96	6	6.24
10 " 11	26	3	11.53	35	1	2.85	61	4	6.55
11 " 12	12	0	.....	22	0	.....	34	0	
12 " 13	13	0	.....	26	2	7.69	39	2	5.12
13 " 14	16	0	.....	16	0	.....	32	0	
14 " 15	12	0	.....	13	0	.....	25	0	
15 " 20	33	1	3.03	42	3	7.14	75	4	5.33
20 " 30	66	0	.....	84	4	4.76	150	4	2.66
30 " 40	28	1	3.57	43	0	.....	71	1	1.40
40 " 50	3	0	.....	8	0	.....	11	0	
50 " 60	4	0	.....	3	0	.....	7	0	
60 " 70	0	0	.....	1	0	.....	1	0	
Totals	947	114	12.09	1015	126	12.41	1962	240	12.23

TABLE II.

Table of 1962 cases of diphtheria in five-year groups; also showing the distribution by sex and the deaths by sex and in total, with the mortality percentages.

Ages in years.	Males.			Females.			Totals.		
	Cases.	Deaths.	Per ct.	Cases.	Deaths.	Per ct.	Cases.	Deaths.	Per ct.
0 to 5 . .	402	80	19.9	368	84	22.8	770	164	21.30
5 " 10 . .	332	29	8.7	354	32	9.0	686	61	8.40
10 " 15 . .	79	3	3.7	112	3	2.6	191	6	3.10
15 " 20 . .	33	1	3.0	42	3	7.1	75	4	5.30
Over 20 . .	101	1	0.99	139	4	2.8	240	5	2.00
Totals . .	947	114	12.09	1015	126	12.41	1962	240	12.23
Under 15 . .	813	112	13.6	834	119	14.2	1647	231	14.00
Over 15 . .	134	2	1.4	181	7	3.8	315	9	2.85
Totals . .	947	114	12.09	1015	126	12.41	1962	240	12.23

An examination of this table shows a decreasing death-rate from infancy to adult life. The other variations, both as to sex and mortality, are probably accidental, and would be eliminated in a sufficiently large number of cases. In Table II. the same cases are grouped into periods of five years of life, and the same decrease in the death-rate from infancy to adult life is shown, but with less minor variations.

If this same series of cases is classified simply by numbers, beginning with the first patient admitted, and numbering consecutively, and then dividing them into groups of one hundred each, the death-rate computed by hundreds varies from 5 per cent. to 19 per cent. This seems to me a very interesting fact, and confirms the observations of Prince[16] concerning the dangers of drawing conclusions from too small numbers of cases.

DISTRIBUTION OF MEMBRANE. A study of the distribution of the diphtheritic membrane shows that in some cases it was on only one tonsil, and in some cases on the posterior pharyngeal wall, and in other cases in the nose or on denuded areas of skin. But in a majority of the cases it was on both tonsils and often elsewhere in addition. In some cases both tonsils, uvula, and soft palate were completely covered; and in such cases when there was considerable attendant œdema of the peritonsillar tissues together with the toxæmia of the disease and the consequent lack of co-ordination of the muscles of the throat and tongue, respiration was seriously impeded. The effects on the respiratory efforts are peculiar, and patients in this condition breathe somewhat as do etherized patients when the tongue falls back against the soft palate. Such cases were sometimes sent to the hospital as cases of laryngeal stenosis; and one adult patient who had been in the hospital about

twelve hours became so cyanotic and distressed for breath as to demand operative interference. He was very ill and semi-conscious, but the coma grew rapidly worse, and finally it was evident that he was getting insufficient air. A digital examination of the throat showed that the pharynx was literally full of diphtheritic membrane. Much of this was forcibly removed, after which the cyanosis became less marked and the patient regained consciousness sufficiently to say that he felt better. He was very ill, however, and we had no hope of his recovery, but from that time he improved, and although the diphtheritic membrane re-formed to some extent, he finally recovered. Antitoxin was given in 8000 unit doses until 110,000 units had been given; and although the throat was not entirely clear the toxæmia seemed relieved and the patient's condition so much improved that no more antitoxin was necessary. He was discharged well after sixty-five days in the hospital.

The following statement shows in detail the distribution of the diphtheritic membrane for this series of cases: In 1528 cases it was on both tonsils; 243 cases on one tonsil; 404 cases on the uvula; 173 cases on the posterior pharyngeal wall; 244 cases on the palate; 12 cases on the lips; 3 cases on the tongue; 4 cases on the epiglottis; 1 case on the inner surface of the cheek; 1 case in the external auditory canal; 1 case at the outer canthus of the eye; 1 case on both labia majoræ and minoræ; 71 cases in the nostrils, and one patient, seven months old, had a patch of diphtheritic membrane on a denuded area of skin in the fold between the neck and shoulder, two and one-half inches by one inch in area, in addition to large patches on both tonsils and soft palate. He recovered, but it took 40,000 units of antitoxin to save his life. In some cases in which the patient was admitted early in the disease the diphtheritic membrane extended and thickened after the administration of antitoxin was begun; but when enough antitoxin had been given to neutralize the existing toxæmia its effect on the membrane was soon noticeable, and the appearance of the latter greatly changed. The diphtheritic membrane represents the amount of local reaction taking place, and is a valuable guide in forming an opinion as to the intensity of the local process; but it is not a safe index of the amount of toxin absorbed and the consequent existing toxæmia. It is therefore but one of the guides in the administration of antitoxin. It often begins to undergo retrograde change, however, soon after the antitoxin treatment is begun, and on account of that remedy, and sometimes disappears completely in twenty-four or forty-eight hours. Sometimes it becomes loosened, rolls up at the edges and peels off in large pieces; sometimes, however, it seems to melt away, leaving adherent streaks which are the last to disappear. In exceptional cases these streaks are very persistent and remain long after the administration of antitoxin has ceased to be

indicated. In the case of the patient referred to who received 110,000 units of antitoxin there were small streaks of exudate on the uvula for twenty-eight days. In 341 cases there was either no diphtheritic membrane on the tonsils or its disappearance was not recorded; and the average number of days before the remaining 1621 throats became perfectly clear was 3.9 days. The throats were not considered clear, however, until all streaks and spots of exudate had disappeared from the tonsils, uvula, palate, and posterior pharyngeal wall.

NASAL DIPHTHERIA. As already stated, there were 71 patients with diphtheritic membrane in the nostrils; and there were 780 who had nasal discharges of such a character as to suggest diphtheritic membrane in the nasopharynx; while bacteriological examination showed the bacilli of diphtheria in the nasal secretions of 790, and in 158 of these the bacilli were found in the nose only. I wish to call especial attention to the fact that in this series of 1962 cases of diphtheria 780 cases, or about 40 per cent. of the entire number, had a more or less severe diphtheritic process in the nose. The frequency and importance of nasal diphtheria is not sufficiently appreciated by the general medical profession, and the matter is but little more than mentioned in the latest text-books. It is not uncommon, however, and attention was called to it before the etiology of the disease was fully understood. There was an epidemic of diphtheria in Boston during the winter of 1888 and 1889 that caused considerable anxiety to the profession, and at one of the meetings devoted to its consideration Dr. McCollum presented a carefully prepared paper which showed "that epidemics are due to contagion, not so much from the severe and recognized forms of the disease, as from the mild and unrecognized types, particularly the nasal."[11] One patient of this series, a boy, two years old, who had severe nasal diphtheria, from which he finally died, came to us from one of the other hospitals of Boston, where he had been under treatment three or four days. As the hospital from which he came had no diphtheria wards, I asked the admitting physician of that institution what other disease the patient had beside diphtheria, and was told that he had none; that he was admitted there because he seemed sick and in need of hospital care. At the time of admission there the patient had a rapid pulse and an elevated temperature; but except for a nasal discharge the physical examination was negative and the case rather obscure. Cultures had been taken, however, and the bacilli of diphtheria found. But in the interim the patient had been in an open ward of a general hospital, and some of the other patients from that ward followed him to the City Hospital.

CULTURES. Cultures were taken from the throat and nose in every case unless the patient died within a few hours of admission. As stated above, the bacilli of diphtheria were present in the nose in 790 cases;

in both nose and throat in 632 cases, and in the nose alone in 158 cases. In 944 cases the bacilli of diphtheria were found in the throat only, and in 228 cases they were not found in either nose or throat. Of these cases not showing the bacilli of diphtheria, 65 were intubed; 21 had beginning laryngeal stenosis, but were given antitoxin freely, and escaped operation; 1 had diphtheritic membrane in the nostrils; 2 coughed up casts from the trachea; 71 died, and the others ran a perfectly typical course of diphtheria and recovered.* It often happened that the first culture taken was negative and the subsequent ones positive. Some of the worst cases, with thick and extensive false membrane, persistently gave negative cultures until the membrane began to disappear, when it became possible to take cultures from the mucous membrane of the throat, and many bacilli of diphtheria would be found. This is because the bacilli, if present in the false membrane, are dead, and will not grow when planted in the culture tube. But when the false membrane has disappeared and cultures can be taken from the *mucous membrane* where bacteria *live* the growth is usually abundant, and if the bacilli of diphtheria are present they may be found. A knowledge of the presence or absence of the bacilli of diphtheria in border-line cases is of the greatest importance; but this test is only one of the many signs and symptoms of diphtheria, and must not be allowed to outweigh all other evidence. A clinical diagnosis of diphtheria is possible, and is often of as great importance as the patient's life is worth.

The physician is not justified in awaiting the results of the autopsy before making a diagnosis of pneumonia; yet the diagnosis of diphtheria is much more important, and it has often happened that patients ill with diphtheria were not sent to the hospital until all hope of recovery was gone, either because the result of the cultures was not known or because a negative report had been given. This is one of the reasons for the large number of moribund cases that are admitted to the hospital. Such patients come to us to die or to drag through a severe and prolonged illness, recovering only after enormous doses of antitoxin have been given. One physician who wanted to send a patient to the hospital, ill, as he said, with non-diphtheritic sore-throat, asked how it is possible to have diphtheria when the cultures are negative. It is not possible to have diphtheria without the presence of the specific germs of that disease at the site of the local process; but there are many chances for error in the somewhat elaborate technique necessary for their cultivation and detection under the microscope.

* If those cases not having positive cultures were ruled out as not diphtheria, the total number of cases would be reduced 11.6 per cent., and the total number of deaths would thereby be reduced 29.6 per cent. The total number of cases would then be 1734, and the total number of deaths 169; and the total death-rate would be 9.7 per cent. instead of 12.23 per cent., as it is for the entire series of 1962 cases. But the 228 cases from whom positive cultures were not obtained were diphtheria, and could not be ruled out.

I am told that one hospital in New England has adopted a rule which denies admission of patients ill with diphtheria until positive cultures have been obtained. If such a custom were followed at the Boston City Hospital the death-rate would be much lower than at present; but it would be at the cost of many lives. I do not wish to be understood as speaking lightly of the value of the bacteriological test for diphtheria; but it is of secondary importance in cases with a severe onset and in the large class of cases in which the physician is called late. Diphtheria is a terrible disease, and an early diagnosis is often the most important thing in the world to the sufferer. Cultures should be taken in every case, but the physician should not await the report of the bacteriologist before giving antitoxin if he *thinks* he is dealing with diphtheria, taking care, of course, to inform himself as to what the early clinical picture of diphtheria really is.

THE HEART. The hearts of this series of cases were examined with great care and frequency, and the results of these examinations faithfully recorded. About 65 per cent. of the cases had some form of cardiac disturbance at some time during the progress of the disease. These disturbances were usually slight, and in a large majority of cases transitory, yet a knowledge of the condition of the heart played an important part in determining the prognosis and treatment as each case progressed. A soft systolic murmur was the most frequent abnormality noted, and was present in 984 cases. It was sometimes heard loudest at the base, sometimes loudest at the apex; but in a majority of cases it was loudest over the mitral area. In some cases the murmur seemed to be due to cardiac dilatation, in a very few cases to an active endocarditis; but usually to a lack of tonicity in the heart muscle. In 496 of these cases with systolic murmurs the heart's action was also more or less irregular. An irregularity in the heart's action was also of frequent occurrence, and was noted in 658 cases. The irregularities varied from cases of well-marked arrhythmia to the most fantastic combinations of irregularity and intermittency. A peculiarity of the irregular action of the hearts of diphtheria patients is the frequency with which the action changes. In some cases there is a simple irregularity in which the variations occur at regular intervals; these intervals may comprise three or four beats, or they may comprise sixty or seventy beats. In other cases the action may be fairly regular at one time, with only an occasional intermittency, and within a few hours be so tumultuous and irregular as to baffle description. Of the 658 cases in which the heart's action was irregular there were 496, as already stated, in which the action was also accompanied by a systolic murmur. There were 22 cases in which a *bruit de galop* or cantering rhythm was noted. This rhythm is always interesting, and was usually very perfect. Fourteen of the patients having this rhythm recovered and eight died. The

irregularity of the heart's action is due to the action of the toxin of diphtheria or its by-products on the nervous system, and is a much more frequent sequel of nasal diphtheria than of the other forms of the disease. This is doubtless due to the more abundant supply of lymphatics to the nasopharynx. This anatomical reason for the greater severity of nasal diphtheria was pointed out by Rotch in 1889.[18] In those cases—496 in number—having both a systolic murmur and an irregularity of action, the murmur was noted before the irregularity in 304 cases; and in the irregularity before the murmur in 79 cases; and the murmur and irregularity were detected at the same time in 113 cases. In 111 cases the most noticeable peculiarity of the heart's action was its great weakness. In 478 cases the cardiac abnormality was present at entrance; in the others it developed in the hospital. In those cases in which the abnormality developed while the patient was under observation it could often be predicted by the peculiar booming character of the heart's sounds.

The accompanying tables (Tables III. and IV.) show the time in the hospital at which the various abnormalities developed and their relative frequency at each four days during the progress of the disease. The histories of the onset of illness in this class of patients are far from reliable; but judging from such histories as were obtainable, together with the condition of the patients at the time of admission to the hospital, it seems fair to conclude that they had been ill *on an average* between two and three days when admitted.* The time varied from one day to two weeks, however.

TABLE III.

Table of 1962 cases of diphtheria, showing the number of cases in which cardiac murmurs only, and irregularity of the heart's action only, occurred, and the day in hospital on which such abnormalities were noted, with the percentages.

The time at which the abnormality was first noted.	Murmurs only.		Irregularity only.	
	Cases.	Per cent.	Cases.	Per cent.
At entrance	215	10.90	30	1.50
By the 5th day in hospital	115	5.80	35	1.70
" 9th " "	69	3.50	36	1.80
" 13th " "	47	2.30	28	1.40
" 17th " "	27	1.30	18	0.91
" 21st " "	10	0.50	3	0.15
" 27th " "	3	0.15	8	0.40
After the 30th " "	2	0.10	4	0.20
Totals	488	24.8	162	8.2

In 22 cases a *bruit de galop* or continuing rhythm was noted. Of this number 8 died and 14 recovered.

* In 134 cases no histories were obtainable. The average duration of illness before admission of the remaining 1828 cases, according to the histories, was 2.5 days.

TABLE IV.

Table of 1962 cases of diphtheria, showing the number of cases in which both cardiac murmurs and irregularity of the heart's action occurred, and the day in the hospital on which such abnormalities were noted, with the percentages.

The time at which the first abnormality to appear was first noted.	Murmur first, irregularity later.		Irregularity first, murmur later.		Both murmur and irregularity detected at the same time.	
	Cases.	Per cent.	Cases.	Per cent.	Cases.	Per cent.
At entrance	170	8.6	20	1.0	43	2.1
By the 5th day in hospital . .	59	3.0	24	1.2	28	1.4
" 9th " " . .	32	1.6	16	0.81	19	0.96
" 13th " " . .	23	1.1	7	0.35	11	0.50
" 17th " " . .	12	0.61	5	0.25	5	0.25
" 21st " " . .	5	0.25	2	0.10	3	0.14
" 25th " " . .	1	0.05	3	0.14	3	0.14
After the 30th " " . .	2	0.10	2	0.10	1	0.05
Totals	304	15.4	79	4.0	113	5.7

The total number of cases with cardiac murmurs was 984, or 50.1 per cent. of the whole. The total number of cases in which the heart's action was irregular was 658, or 33.5 per cent. of the whole.

PULSE. As is well-known the toxin of diphtheria or its by-products in the human system produces a rapid action of the heart. The pulse-rate is therefore an important guide in the prognosis. and often a valuable aid in the diagnosis of diphtheria. Patients at the beginning of an attack of diphtheria often do not feel ill except for chilly sensations, a feeling of lassitude, and possibly an attack of vomiting. It also often happens that the initial temperature is transitory.* But the pulse is almost always accelerated out of all proportion to the other symptoms. In such cases with a history of sore-throat or nasal discharge it is a great help in forming a correct diagnosis. Later in the disease patients who are being treated with antitoxin are often very comfortable; but if the pulse-rate continues high they are still much more seriously ill than they themselves can possibly realize. I have repeatedly been obliged to tell my adult patients that they were still seriously ill when they declared they felt as well as ever in their lives. A rapid pulse early in an attack of illness, especially if it is out of proportion to the temperature, and if the patient does not feel much sick, and thinks he has contracted a cold, should lead one to consider the possibility of

* For a careful consideration of the temperature in diphtheria see Dr. McCollum's paper, "A Clinical Study of Eight Hundred Cases of Diphtheria," Medical and Surgical Reports of the Boston City Hospital, Ninth Series, 1898. His conclusions in brief are, "that the temperature in this disease is not specially elevated . . . and that when an elevated temperature is present it is usually due to some complication." My observations are entirely in accord with these conclusions. Moreover, the temperature in no way indicates either the severity of the infection or the seriousness of the illness in uncomplicated diphtheria, and is of importance only as a symptom of existing complications and a guide in prognosis and treatment.

diphtheria. A rapid pulse continuing after the initial period of an attack of diphtheria means a guarded prognosis, as to the time of recovery at least, and *continued rest in bed*. The pulse of one ill with diphtheria is often of a variable quality, and may be full and strong at one time, and within an incredibly short time become soft and weak and irregular or intermittent. It is therefore not safe to await a soft pulse before beginning stimulation; and the pulse must be considered in connection with the existing toxæmia.

The accompanying table (Table V.) gives the maximum pulse-rate and the corresponding mortality percentages for this series of cases. For the compilation of this table the cases are first divided into those under five years of age and those above that age, as the pulse in early childhood is normally high; and later the 1962 cases are considered as a whole.

TABLE V.

Table of 1962 cases of diphtheria, showing the maximum pulse-rate for all patients under five years of age, and for all patients above that age separately; and also for all patients of all ages, with the deaths and mortality percentages.

Maximum pulse.	All cases under 5 years.			All cases over 5 years.			All cases of all ages.		
	Cases.	Deaths.	Per ct.	Cases.	Deaths.	Per ct.	Cases.	Deaths.	Per ct.
Less than 100	13	1	7.6	312	5	1.6	325	6	1.8
" " 110	40	2	5.0	189	9*	4.7	229	11	4.8
" " 120	168	14	8.4	358	19	5.3	526	33	6.2
" " 130	140	15	10.7	164	16*	9.7	304	31	10.1
" " 140	216	52	27.0	106	14	13.2	322	66	20.4
" " 150	58	19	32.7	31	3	9.6	89	22	24.7
" " 160	86	28	32.5	23	4	17.3	109	32	29.3
" " 170	16	10	62.5	2	1	50.0	18	11	61.1
" " 180	14	11	78.5	4	2	50.0	18	13	72.2
" " 190	4	2	50.0	1	1	100.0	5	3	60.0
" " 200	15	10	66.6	2	2	100.0	17	12	70.5
	770	164		1192	76		1962	240	

ALBUMINURIA. All those who studied diphtheria before antitoxin was used in its treatment agree that albuminuria was of very common occurrence in the disease. Osler[19] says that it is present in all severe cases, and Rotch[20] says that it is so frequent that it should be considered as a part of the disease.

The free use of antitoxin has changed this, however, and those patients treated early and with large doses often do not have albuminuria at any period of the disease. The urines in this series of cases were examined in the hospital laboratory by the house officers, under the direction of Dr. J. B. Ogden, and albumin was found in less than one-third of the entire number from whom specimens could be obtained. In 205 cases no specimen could be obtained, either on account of the extreme illness or youth of the patient. Of this number, 121 died: 50

* One each had a pulse of 30 beats per minute before death.

of these within twenty-four hours of admission. In the latter cases, of course, no opinion could be formed as to the condition of the kidneys. In the case of one patient who lived more than twenty-four hours in the hospital, the urine was greatly diminished in amount, and death occurred from the toxæmia of diphtheria in five days. In another case there was suppression of urine, and the patient died on the sixth day in the hospital; and in still another case, that of an infant, one year old, the patient died in convulsions on the third day in the hospital. Although this patient's skin was moist and his napkin freely wet, and the convulsions seemed to be due to the toxæmia of diphtheria, the possibility of a nephritis must be considered. In the other fatal cases from whom specimens were unobtainable there was no clinical evidence of nephritis.

The urine was examined in 1757 cases, and in no case was more than one-fourth of 1 per cent. of albumin found. There was one-fourth of 1 per cent. in 12 cases; one-eighth of 1 per cent. in 41 cases; one-tenth of 1 per cent. in 29 cases; a large trace in 38 cases; a slight trace in 121 cases; the slightest possible trace in 230 cases; and in 1256 cases no albumin was found.* The urine was somewhat diminished in amount in many cases; was greatly diminished in amount in six cases, and there was suppression in three cases in addition to the one already mentioned. There was acute retention in quite a number of cases; but catheterization was necessary in only three or four instances, hot fomentations usually being sufficient to relieve the trouble.

In those cases in which the urine was greatly diminished in amount the use of hot packs was usually of great benefit, and only one of the six cases terminated fatally. In the cases of suppression hot packs were also tried, but in only one case did the patient recover. Great care is necessary in the administration of hot packs to diphtheria patients, on account of the weakened condition of the heart; and they were never given unless a physician could remain with the patient during the entire time of the treatment. If the pulse became very rapid, or weak, or intermittent, or if the patient seemed depressed or greatly disturbed by the pack, it was at once discontinued. If conditions did not improve, however, the pack was again tried, and sometimes with remarkably good results. Water, lemonade, and magnesium sulphate were the only diuretics that seemed to be of value in these cases.

As a rule, there was but little œdema in these cases of nephritis; but in two boys, aged seven and nine years, both of whom had been very ill, had palatal paralysis, strabismus, and great emaciation, there was marked œdema of the scrotum, the organ becoming in each case con-

* In those cases from whom specimens were obtainable the urine was examined once every four or five days during the course of the disease. It is possible that daily examinations would have revealed some slight transitory albuminurias that thus escaped observation. Such conditions, if they existed, were of no clinical importance, however; but, of course, would be of scientific interest.

siderably larger than a baseball. Both finally recovered, and at the time of discharge from the hospital their urines were free from albumin. One was in the hospital fifty-seven days and the other seventy-five days. In the non-fatal cases the nephritis was usually transitory, and but few patients were discharged with albuminuria. In none of the fatal cases could death be attributed to nephritis; even those three cases in which suppression occurred showed in addition to this symptom the usual manifestations of the toxæmia of diphtheria.

The accompanying table (Table VI.) shows the number of cases in which the various amounts of albumin occurred; the number of patients who died, showing the corresponding amount of albumin with the mortality percentages.

TABLE VI.

Table of 1757 cases of diphtheria in which the urine was examined, showing the number of cases in which the various amounts occurred, with the deaths and mortality percentages.

	Cases.	Deaths.	Per cent.
No albumin found	1256	27	2.1
The slightest possible trace of albumin	230	24	10.4
A slight trace of albumin	121	14	11.5
A trace of albumin	38	11	28.9
A large trace of albumin	20	11	36.6
1/10 of one per cent. of albumin	29	13	44.8
1/8 " " "	41	14	34.6
1/4 " " "	12	5	41.6
Total number examined	1752	119	6.7
" " not examined	205	121	59.0

Total number of cases examined	1752
" " with albuminuria	501
Percentage of cases showing albuminuria	28.5

LARYNGEAL STENOSIS. In this series of 1962 cases of diphtheria there were 337 cases of laryngeal stenosis. Of this number 213 were intubed and 124 responded promptly to the use of antitoxin and were relieved without intubation. Those who escaped operation were usually the ones sent to the hospital early in the disease. A majority of the operative cases demanded immediate relief, and were intubed as soon as admitted. In some cases, however, operation was deferred, with the hope that it would not be necessary, and was done later. Thirty-five patients were intubed during the second day in the hospital; but in only one instance was intubation first performed later than forty-eight hours after admission, and in this case the operation did not afford relief, and the autopsy showed that the trouble was below the larynx. Of the laryngeal cases not intubed twelve were adults, three of whom coughed up membranous casts of the trachea and bronchi. One young woman, aged twenty-four years, coughed up two casts, each of which extended from the larynx to the secondary bronchi, and measured nine inches in length. The first was not of great thickness, but was a per-

fect cast; but the second, which was dislodged thirty hours after the first, was thick and leathery and showed the markings of the cartilages of the trachea with great distinctness. It also demonstrated the fact that thick and extensive diphtheritic membrane may form in the air passages with great rapidity. The patient was given antitoxin freely and oxygen was used, but she died from the toxæmia of diphtheria forty-eight hours later. Two of the other adults died from pneumonia, evidently diphtheritic in origin, as casts of the secondary bronchi were coughed up by both, and there was no rusty sputum, although there were many râles of all descriptions, and both patients lived long enough for the resolution of a diplococcus pneumonia to begin. Of the remaining laryngeal cases who escaped operation 112 were under fifteen years of age, and all but 7 recovered. In addition to beginning laryngeal stenosis 60 of these 124 cases had nasal diphtheria and 103 had false membrane on the tonsils, 49 having nasal, pharyngeal, and laryngeal diphtheria, and in only 10 cases was the disease confined to the larynx. The death-rate for the entire 337 laryngeal cases was 31.4 per cent.; for the early cases who escaped operation, 8 per cent.; and for the operative cases, 45 per cent. Intubation was not performed unless it was absolutely necessary, the patient being given the benefit of the doubt in every case; for with the greatest skill in operating there is more or less shock to the patient, and the careful husbanding of the strength of those ill with diphtheria is of the greatest importance.

Intubation. Of the 213 intubations 96 died, 37 of them within twenty-four hours of admission; 40 during the acute stage of the disease, and within ten days of admission, from the toxæmia of diphtheria; 15 after the acute stage of the disease or from the degenerative processes of diphtheria, and 4 from pneumonia. Bronchopneumonia is of common occurrence in laryngeal diphtheria, not only in those cases that are intubed, but also in those cases who escape that operation. I believe, however, that many of the cases of death formerly attributed to this complication and to the extension of membrane are due to the toxæmia of diphtheria. Many of the cases of this series presented most of the symptoms of bronchopneumonia, and yet that disease did not exist. One boy, aged two years, who was intubed at entrance, died in three days, and came to autopsy, is an instance of this. The laryngeal tube afforded but partial and temporary relief, and was repeatedly removed and reinserted. No membrane was found in the tube, but it was always partially occluded with thick, tenacious mucus. The patient was restless and cyanotic, with hurried respiration and considerable delirium. Examination of the chest showed normal resonance and many râles. Râles in an intubation case are always of doubtful import. A differential diagnosis between a beginning bronchopneumonia and extension of membrane could not be made with definiteness, but the evidence seemed to be in favor of the latter. The autopsy showed, however,

that there was neither bronchopneumonia nor diphtheritic membrane in the lungs; but the bronchi, to their ultimate ramifications, were filled with the same thick, tenacious mucus that had been found in the tube; and cultures taken from this mucus showed myriads of the bacilli of diphtheria. Another patient, a boy, aged seven years, who was intubed at entrance and with but temporary relief, also had his tube removed and reinserted repeatedly. His tube was also partially occluded with thick, tenacious mucus each time it was removed, and when allowed to go without the tube the larynx would become filled with the same material, which, as it became dry, would completely obstruct respiration. Antitoxin was given in large doses at frequent intervals, and the character of the mucus changed to such an extent that the patient could clear the tube by coughing. Finally, the bronchial secretions became normal in character and amount, the respirations became less hurried, the peculiar distressed facial expression of the toxæmia of diphtheria disappeared, and the patient recovered. There were other similar cases, many of which were saved by a liberal use of antitoxin and careful attention to the laryngeal tube. If the infection in such cases is less severe and the patient is able to withstand the toxæmia of the disease for a sufficient time, the probabilities are that the presence of the bacilli of diphtheria in the bronchi would lead either to a deposit of diphtheritic membrane or to the development of a bronchopneumonia, and possibly to both complications. There were cases in which the diphtheritic membrane extended into the bronchi; and one of these, a girl, aged three years, coughed up a cast of the trachea and primary and secondary bronchi, on one side of which there were seven branches to the bronchial cast. This patient rallied from the toxæmia, but died from pneumonia twenty days after admission.

Reintubation was necessary in many cases, either because the tube became occluded and had to be removed or because it was coughed up by the patient. One boy who persistently coughed up his tube, and who had paralysis of the vocal cords, was intubed thirteen times, and finally recovered. Another boy, aged three years, developed post-diphtheritic paralysis, and was reintubed thirty-three days after the tube was first removed. The relief afforded was marked; the tube was worn six days and then removed, and the patient finally recovered.

TRACHEOTOMY. In three cases of this series in which the O'Dwyer tube failed to give relief a subsequent tracheotomy was performed. This operation proved useless, and all three patients died. One, who had been ill several days, and was scarcely breathing at entrance, was intubed without benefit, and soon stopped breathing. As it was impossible to revive her, tracheotomy was performed and only thick, tenacious mucus found in the trachea, and the patient did not breathe. I now think that this patient died from toxæmia and not from stenosis.

In another case, that of a boy, aged two years, the patient had been in the hospital about twelve hours, during which time he had worn a tube, but had breathed with difficulty, and seemed severely poisoned by the disease. His mother was visiting him, and he attempted to get up, when he collapsed and stopped breathing. He was hastily taken to the operating-room and the tube removed. It was not occluded, and when it had been replaced artificial respiration and subcutaneous stimulation restored animation somewhat; but as there was still great difficulty in breathing, tracheotomy was performed. Streaks of diphtheritic membrane were found in the trachea, but the respiration was no better after the operation, and the patient died from the toxæmia of diphtheria in about an hour. Autopsy could not be obtained.

In the third case the difficulty proved to be due to the presence of thick mucus, and the patient responded to antitoxin and lived comfortably for a time, but died from a streptococcus pneumonia ten days after the operation. The autopsy showed that the bronchial secretions had become normal.

In two other cases, not included in this series, in which intubation failed to give relief, tracheotomy was performed and saved the patients' lives. One of them died from general peritonitis later, however. One case was that of a child, aged twenty months, who was sent to the hospital as an urgent case of laryngeal diphtheria. When seen by me she was suffering from marked stenosis and was extremely cyanotic. She was intubed at once, but was afforded no relief. A longer tube was inserted; but with this tube in the larynx respiration was impossible, and all respiratory efforts ceased. A hasty incision was made in the median line of the neck, but instead of finding the trachea the knife opened a pocket beneath the deep cervical fascia, which contained thick pus. Before the surgical landmarks could be located there was a spasmodic gasp, and artificial respiration soon restored animation and the child began to cry, thus showing that there was no trouble with the larynx. An examination of that organ now showed that it was normal and that the obstruction had been lower down and from without. There had been no unusual fulness of the neck, the outlines were perfect, and examination of the parts after the operation showed the skin and superficial tissues to be normal. The trachea had been but slightly nicked, and soon healed. As the patient had been in the operating-room of a diphtheria ward she was given antitoxin and kept in that ward, where she made a rapid recovery, and was discharged, with the wound healed, in about three weeks.

The other cases was that of a man who had had a moderate attack of diphtheria and was almost ready for discharge when a cervical adenitis developed. This caused great discomfort, and the patient finally complained of great difficulty in swallowing. A satisfactory examination of the throat was impossible on account of the swelling and tender-

ness at the angles of the jaw. One morning when I saw him he seemed mentally distressed and said he was about to choke. His color was somewhat dusky, but he was able to phonate, although the quality of the voice suggested greatly enlarged tonsils. I saw no cause for alarm, however, and tried to reassure him. Within half an hour I was called to him in great haste and found that he was only gasping. He was immediately intubed, after which he breathed a time or two, but soon coughed and again stopped breathing. The tube was removed and re-inserted; and after each operation the patient breathed two or three times. The trachea was now opened and found to contain pus. After the tracheotomy tube was in place and the trachea had been feathered out the patient breathed freely and spat out considerable bloody pus. Consciousness returned and the patient became very comfortable. A satisfactory examination of the throat was still impossible and never advisable during life. The tracheotomy tube was omitted on the third day, and respiration was unimpeded. The patient continued very ill, however, but made no special complaint, and died two days later. The autopsy showed that the glands in the neck had broken down and there was the site of a post-pharyngeal abscess, which had ruptured very low down; and it was evidently from the effects of this that the patient had suffered at the time that tracheotomy was performed. There was no pneumonia, but there was an extensive and general peritonitis.

Experience gained from treating this series of 1962 cases and from the observation of many other cases of diphtheria, as well as from the teaching of Dr. McCollum, leads to the overwhelming conviction that primary tracheotomy no longer has a place in the treatment of simple diphtheritic laryngeal stenosis.

TABLE VII.

Table of 337 cases of laryngeal diphtheria, 213 of whom were intubed, showing the distribution by age and by sex, with the mortality percentages.

Ages in years.	Males.			Females.			Totals.		
	Cases.	Deaths.	Per ct.	Cases.	Deaths.	Per ct.	Cases.	Deaths.	Per ct.
0 to 1	9	4	44.4	5	4	80.0	14	8	57.1
1 " 2	21	15	71.4	29	12	41.3	50	27	54.0
2 " 3	29	11	37.9	20	10	50.0	49	21	44.8
3 " 4	37	9	24.3	24	9	37.5	61	18	29.5
4 " 5	29	5	17.2	24	8	35.0	53	13	24.5
5 " 6	20	4	20.0	19	2	10.5	39	6	15.3
6 " 7	15	4	26.6	14	2	14.2	29	6	20.6
7 " 8	7	...	.....	17	2	28.5	14	2	14.2
8 " 9	4	...	.....	0	0	.....	4	0	
9 " 10	2	...	.....	2	1	50.0	4	1	25.0
10 " 11	2	...	.....	3	0	.....	5	0	
11 " 12	0	...	.....	0	0	.....	0	0	
12 " 13	0	...	.....	1	1	100.0	1	1	100.0
13 " 14	0	...	.....	1	0	.....	1	0	
14 " 15	1	...	.....	0	0	.....	1	0	
Over 15	4	...	.....	8	3	37.5	12	3	25.0
Totals	180	52	28.8	157	54	34.3	337	106	31.4

TABLE VIII.

Table of 213 cases of laryngeal diphtheria in which intubation was performed, showing the distribution by age and by sex, with the mortality percentages.

Ages in years.	Males.			Females.			Totals.		
	Cases.	Deaths.	Per ct.	Cases.	Deaths.	Per ct.	Cases.	Deaths.	Per ct.
0 to 1	6	3	50.0	4	4	100.0	10	7	70.0
1 " 2	16	14	87.5	21	11	52.3	37	25	67.5
2 " 3	21	10	47.6	16	10	62.5	37	20	54.0
3 " 4	26	9	34.6	17	8	47.0	43	17	39.5
4 " 5	16	5	31.2	16	7	43.7	32	12	37.5
5 " 6	12	4	33.3	8	1	12.5	20	5	25.0
6 " 7	12	4	33.3	5	2	40.0	17	6	35.2
7 " 8	6	...	.....	4	2	50.0	10	2	20.0
8 " 9	3	...	.....	0	...	.....	3	1	33.3
9 " 10	1	...	.....	2	1	50.0	3		
10 " 11	0	...	.....	0	...	.....	0		
11 " 12	0	...	.....	0	...	.....	0		
12 " 13	0	...	.....	1	1	100.0	1	1	100.0
13 " 14									
14 " 15									
Over 15									
Totals	119	49	41.1	94	47	50.0	213	96*	45.0

The preceding tables (Tables VII. and VIII.) show the distribution by age and by sex of this series of 337 cases of laryngeal diphtheria as a whole, and also of the 213 cases that were intubed separately.

COMPLICATIONS. The complications that may arise during an attack of diphtheria in addition to those of the heart, kidneys, and lungs, already mentioned, are many; but the most important are the glandular enlargements, acute middle-ear disease, and post-diphtheritic paralysis. Tonsillitis and peritonsillar abscess due to infection of the tissues with various pyogenic bacteria sometimes occur during convalescence. Delirium, sometimes active and sometimes of the low, muttering type, may occur during the acute toxic period of the disease. It is more frequent in those laryngeal cases in which the trachea and bronchi are filled with thick, tenacious mucus and the patients die from toxæmia during the first few days; but it may occur in cases of simple pharyngeal diphtheria, and is occasionally seen in those patients with a high initial temperature, and usually disappears as the latter subsides.

Vomiting as an initial symptom sometimes occurs, and was said by those giving the histories to have been noticed in 531 instances in this series of cases, or in 27 per cent. of the entire number. This symptom during convalescence is usually of bad import, and is frequently due to nerve degeneration. When it occurs in a patient whose heart is irregular or who presents other evidence of nerve degeneration it is always a danger signal, and is often the beginning of the end.

* Thirty-seven died within twenty-four hours of admission.

An examination of the cervical and submaxillary glands at entrance showed that in this series of 1962 cases they were more or less enlarged in 1058 cases, or in 53.9 per cent. of the entire number. In 965 cases the enlargement was slight or moderate, the glands varying in size from that of a pea to that of a walnut. In 93 cases, however, they were greatly enlarged, often completely obliterating the outlines of the jaw and chin; and some of these were sent to the hospital as cases of diphtheria and mumps, although the adenitis was confined to the glands mentioned. A secondary glandular enlargement occurred in 134 instances, or in 6.8 per cent. of the cases; and in 31 of these cases only was incision necessary. By secondary glandular enlargement is meant one not accompanying the acute stage of the disease, but occurring during the secondary stage, and probably not directly due to the diphtheritic process. It is usually due to an infection of the now vulnerable tissues with pyogenic organisms. Sometimes an early application of cold by means of an ice-collar is sufficient to allay the process; but if the tissues soften and there is evidence of pus they must be incised and drained. The pus is usually contained in the glandular capsule, and curetting is, therefore, not necessary. Experience teaches that general surgical principles must find an exception here, and the incision made should be small. The injury to the skin is slight, and the scar formed is often almost imperceptible and entirely escapes casual observation.

Middle-ear disease was not a frequent complication, and occurred in 61 cases only, or in 3 per cent. of the entire number. In 31 cases the left ear only was affected; in 15 cases the right ear only, and in 15 cases both ears were affected. In one case in which both ears were affected the mastoid cells on the left became involved, and an operation for the relief of that condition was performed by Dr. Leland. The patient was an underfed foundling, who came to the hospital with diphtheria and suppurating ears; but after a residence of ninety-seven days in the hospital he was discharged well and in good condition. In only three cases was there complaint of aural pain. In two of these bulging membrana tympani were found, and paracentesis was performed; the other yielded to treatment without incision. In the remaining 58 cases the tympanic membranes ruptured spontaneously and without pain, and the discharge was usually purulent from the first. The bacilli of diphtheria were found in the discharges in 6 cases, but the common pyogenic organisms were the usual bacteria present. The absence of pain, the spontaneous rupture of the membrana tympani, and the purulent character of the discharge suggest a subacute rather than a really acute process. It usually yielded promptly to treatment, especially when the patient was improving, and as convalescence advanced, although in a few cases the discharge continued until the patient had entirely recovered from his attack of diphtheria.

The fact that the toxin of diphtheria possesses a powerful destructive property for nerve tissue has been pointed out by Thomas[21] and others. The amount of harm done this tissue varies greatly, and the clinical manifestations of the changes produced are not always commensurate with the *apparent* severity of the attack of diphtheria. It is probable, however, that the attention of the busy clinician is attracted only by those cases in which the changes are well marked. Beside the cardiac disturbances already mentioned that may be due to nerve degeneration, post-diphtheritic paralysis is frequent, but much less common than before antitoxin was used. Of the various paralyses that may occur palatal paralysis is the most common, and occurred in 72 of the patients of this series, and there were, in addition, other patients whose voices assumed an unnatural nasal quality. There were 19 cases of oculomotor paralysis, resulting in all varieties and degrees of strabismus; and 6 recorded cases of diplopia, although it is probable that this symptom was more frequent, as many of the patients were very young. There was 1 case of paralysis of one deltoid muscle; 1 case of hemiplegia; 2 cases of peculiar nervous twitchings of the fingers, hands, arms, and shoulders, and 1 comparatively mild case of acute chorea. The patellar reflexes were diminished in many cases and absent in a few cases; but complete records of such changes, unfortunately, were not kept. There were two cases of acute neuritis during the active stage of the disease, and two patients returned to the hospital for advice with beginning peripheral neuritis, one three weeks and the other six weeks after discharge.

The degenerative changes produced by the toxin of diphtheria are by no means confined to the nervous system. In those severe and prolonged cases which finally result in death, and in many similar cases that are saved by patient nursing and careful feeding, there are clinical evidences of profound changes in all the tissues of the body. The skin becomes dry and harsh, the adipose tissue largely disappears, the muscles become soft and flabby and weak; the urine is diminished in amount and contains evidence of changes in the kidneys; the heart is weak and often irregular in action; and the patient is apathetic and somnolent, often sleeping most of the time. This series of changes produces an appearance in the patient that is as characteristic of severe and late diphtheria as is the peculiar symptom complex of typhoid fever that is termed "typhoidal." The pathological findings in those cases that come to autopsy are in accord with these clinical observations.

Fatal Cases. As already stated, 240 of this series of cases died. Attention has also been called to the fact that there was an unusually large number of cases of diphtheria in Boston during the time covered by this study. From August 1, 1899, to August 1, 1900, 3697 cases

of diphtheria were reported to the Board of Health, and 2095* of these were treated in the hospital. It is well known that the worst cases and the neglected cases are the ones usually sent to hospitals. As a proof that this series of cases is not an exception to the rule, I have made inquiry of the various physicians who have reported cases of diphtheria to the Board of Health, and find that only 44 cases of laryngeal diphtheria were treated outside the hospital; whereas 356† cases of laryngeal diphtheria were treated in the hospital. In other words, 56.6 per cent. of the cases of diphtheria in Boston were treated in the hospital, and 89 per cent. of the cases of the laryngeal type, the most fatal form of the disease, were treated in the hospital.

Many patients were sent to the hospital only when the attending physician assured the parents that further home treatment was useless, and the only chance of recovery was with hospital care; and many such cases were not seen by the physician until the disease had reached this stage. It, therefore, happened that many moribund cases were admitted to the hospital, and 69 of them died within twenty-four hours of admission—that is, 28.5 per cent. of the deaths occurred in patients admittedly too far advanced in the disease to respond to treatment. In addition to these 69 cases 103 others died from the toxæmia of the disease, and all but 9 of them within ten days of admission. There were 54 patients who died from the degeneration of the various tissues,-or the effects of such changes, and late in the disease, and 14 patients who died from pneumonia as a complication of the diphtheritic process. In other words, 172 patients, or 71.6 per cent., of the fatal cases died during the acute stage of the disease, and 54 patients, or 22.5 per cent., of the fatal cases died during the secondary stage of the disease; and 14 patients, or 5.8 per cent., of the fatal cases died from the effects of diphtheria plus another disease, probably not caused by the diphtheria and without which they might have recovered.

This classification of deaths seems the only rational one possible, and it has the advantage of avoiding the various terms descriptive only of a part of the condition. The cause of death in all the cases was diphtheria; and all patients dead of that disease show more or less changes in all the principal tissues of the body; and those changes vary principally in extent and duration, and not essentially in character. It is not consistent with the facts to say that a patient dies from nephritis when his kidneys are but little more affected than his heart or his nervous system if all the changes are due to a common cause; nor is it true that patients die from heart failure or nerve degeneration when all the other tissues of the body are alike affected by the same destructive agency. The terms heart failure and nerve degeneration are inadequate and not

* This number includes the 131 cases of mixed infection yet to be considered.
† Including mixed cases.

applicable in a disease caused by so diffusable and non-selective a poison as is the toxin of diphtheria.

Mixed Infection. Mention has already been made of the fact that the total number of cases of diphtheria admitted to the hospital during the time covered by this study was 2093, and that 131 cases proved to have a mixed infection. The cases of mixed infection are interesting in this connection chiefly to show that simultaneous infection with diphtheria and scarlet fever is not an uncommon occurrence. All of the 131 cases had perfectly characteristic and usually severe attacks of diphtheria; and the bacilli of diphtheria were found in cultures from all but three, and two of these coughed up casts of diphtheritic membrane from the trachea, and the other had large patches of diphtheritic membrane on the tonsils and a nasal discharge such as occurs only in diphtheria. In 15 cases there was a history of exposure to scarlet fever before admission, and in a few other cases, possibly ten, there was something in the appearance of the throat or tongue that aroused suspicion and led to the isolation of the patient at entrance. In the majority of cases, however, there was nothing in the appearance of the patient when admitted to suggest a double infection. None of these 131 patients was exposed to scarlet fever while in the hospital, and the usual time that elapsed between admission and the appearance of the first symptoms of scarlet fever was three or four days, although in some cases only one day intervened, and in the case of one patient whose brother was in the scarlet fever ward an isolation of ten days was necessary, and in a somewhat similar case a patient was isolated twelve days before the diagnosis of scarlet fever was possible. In some cases in which the first symptoms of scarlet fever were delayed six or seven days the throat had entirely cleared before the appearance of the sore-throat of scarlet fever. Of the 131 cases of mixed infection 19 had laryngeal diphtheria, and 13 of these were intubed. The death-rate in mixed infection is always high; and of this series of 131 cases 41 died, giving a death-rate of 31.3 per cent. But mortality percentages based on so small a number of cases are of little value.

Treatment. Diphtheria combines in a peculiar manner problems that are alike of interest to both physician and surgeon; and the proper treatment of the disease demands the wisdom and skill of both. It is the disease *par excellence* of which the etiology, morbid processes, and cure are known, and the complications that may arise during its progress are varied and interesting. It is true that our knowledge is yet imperfect and incomplete; but it is already sufficient to place the disease in a class by itself. It must be considered as an entity; and the various changes noted regarded as different manifestations of a common cause. That cause is a known and destructive poison; but fortunately we have found and are able to produce its antidote. In

its treatment, therefore, aside from the complications that may arise, the problems with which the clinician is confronted relate solely to the amount of toxin absorbed into the system of the patient, the susceptibility of the individual patient to the toxin absorbed; and the means to be employed in neutralizing this toxin in the system, and in fortifying the patient to withstand the effects of the toxin that has already produced its destructive effects. In antitoxin we have a remedy which possesses the power of perfectly neutralizing the toxin, and the recovery of the patient depends almost entirely on whether or not this remedy is administered early enough and in sufficient quantity. Unfortunately there is no way in which a definite knowledge of the amount of toxin absorbed by a given patient can be obtained. The number of the bacilli of diphtheria infecting a patient cannot be determined, and, moreover, the virulence of these bacilli varies within wide limits.* The susceptibility of the individual is also an unknown quantity. It is therefore impossible to determine *a priori* the amount of antitoxin required in a given case. Here, as in many conditions, we have to rely on clinical observation. Laboratory experiments with the toxin of diphtheria are of but little help to the clinician, for in the laboratory known qualities are dealt with, while at the bedside the quantities are unknown and unknowable. The amount and character of the diphtheritic membrane, however, the quality and frequency of the pulse, the expression of the face and eyes, and the general appearance of the patient aid in forming an opinion. The amount of diphtheritic membrane alone is an imperfect guide; and it is often necessary to continue giving antitoxin after this has disappeared, for evidences of toxæmia sometimes outlast the false membrane. At best it is impossible to determine accurately how much toxin has been absorbed and how much harm done before it has been neutralized; and we therefore say that diphtheria is a treacherous disease and always give a guarded prognosis. Clinical experience teaches, however, that the effects of antitoxin are only salutary, and there is no danger in giving too much. Clinical experience also teaches that the sooner the total amount of antitoxin required can be given the better. At the hospital, therefore, we give 4000 unit doses and repeat every four hours as long as may be necessary. In some exceptionally severe and late cases I have given 4000 units every two hours and in some cases 8000 units every four hours. This method does not allow time for marked change in the false membrane between the doses; but, as already stated, the appearance of the

* Theobald Smith has shown that by special methods of cultivation the toxin-producing power of any diphtheria bacillus may be greatly increased. He says, "I have thus far increased the toxin production of two diphtheria bacilli by a combination of the methods outlined, so that the minimum fatal doses of 0.04 c.c. and 0.05 c.c. for a guinea-pig of 250-300 grammes, as obtained by the method of Spronck, have been reduced to 0.007 c.c. and 0.015 c.c. respectively." —Journal of the Boston Society of Medical Sciences, June, 1899, vol. iii., p. 318.

membrane is but one of the many signs and symptoms to be considered. Some patients have thus received large quantities of antitoxin, and some moribund and apparently hopeless cases have been saved from death. Some of the recoveries that have attended this mode of treatment have been so wonderful that only those who have seen them can appreciate them; and if the cases were reported here in detail the writer would probably be pronounced an irresponsible enthusiast. I believe, however, that the logical conclusions deducible from the statistics gathered from a study of this series of cases and from comparison with other statistics of large numbers of cases studied before antitoxin was used cannot be other than favorable to this mode of treatment. The death-rate from diphtheria in the Boston City Hospital for four years and one month previous to February 1, 1894, and for the last series of cases treated without antitoxin, was 45.3 per cent. The death-rate for this series of cases comprising those treated in the same institution during an entire year is 12.23 per cent.—that is, the death-rate has been lowered 33 per cent. Not all of the patients of this series of 1962 cases received large amounts of antitoxin. The dose was not repeated unless necessary; and there were 321 patients who received only one dose of 4000 units or less during their illness.

In writing of diphtheria before antitoxin was used Osler[22] says: "No disease of temperate regions proves more fatal to nurses and physicians." Yet during the existence of the present contagious department of the Boston City Hospital, during all of which time antitoxin has been used, more than 7000 cases of diphtheria have been treated and more than 100 nurses, physicians, and employés of the department have contracted the disease, and there has not been a death among them.

This series of cases has afforded an exceptional opportunity for studying the effects of antitoxin on early diphtheritic membrane. Many of the cases came under my personal observation, and I have repeatedly seen the false membrane extend and thicken even after three or four 4000-unit doses of antitoxin had been given; and then rapidly disappear when double that amount had been given, the patient making a rapid and uncomplicated recovery.

The earlier cases of this series of hospital attachés were ill, on the average, much longer than the later ones; for the dose of antitoxin is at present more than double what it was four years ago, and the intervals between the doses are much shorter.

The use of antitoxin is often followed by an eruption of urticaria or erythema multiforme, or a combination of the two, and rarely by pains in the joints. These sequelæ are probably due to the serum containing the antitoxin, and are somewhat annoying and often perplexing, for some of the antitoxin rashes at an early stage resemble the eruption of scarlet fever; and there is sometimes a rise of temperature before the

appearance of its cause. The arthralgia is not due to inflammatory processes, and is usually of short duration, occurring more frequently in adults than in children. It is sometimes severe, and the use of morphine may be necessary in its treatment. These disturbances are never dangerous, and are usually of short duration.

The value of alcoholic stimulation in diphtheria is so well known and generally accepted that it need not be dwelt upon here. I wish to emphasize the fact, however, that it should be used freely and frequently, and sufficiently early in the disease to ward off if possible the attacks of extreme weakness and collapse that are not uncommon in those patients whose tissues are undergoing degenerative changes. A rapid pulse is not a contraindication, and, generally speaking, the amount of toxæmia or evidence of degenerative changes are better guides in its use than the pulse.

Considering the fact that the heart-muscle becomes flabby and shows more or less evidence of fatty degeneration early in the disease, the use of digitalis is indicated only in exceptional cases.

Hot packs have been of especial value in those cases showing diminished urinary secretion, and drachm doses of a saturated solution of magnesium sulphate given every hour has proven of value as a diuretic in children.

All intubed patients are fed by means of an œsophageal tube; and it has been found better to feed them in a partially sitting posture, supported by the nurse, as this method is less liable to give rise to inhalation pneumonia.

In many cases, both of adults and of children, in which vomiting has been an annoying and persistent source of danger, rectal feedings have been of great assistance. The rectum in children is surprisingly tolerant of such treatment, provided only that the quantity given is not too large and care is exercised in its administration, and also that the feedings are given only once in six hours.

Symptoms as they arise must be the guide for the further treatment. But the physician must constantly bear in mind the character and the extent of the degenerative changes possible in this disease, and exercise the utmost care and caution in allowing his patients to sit up and walk about. The heart is usually a reliable guide in this, and if it is not affected by a short time out of bed the time up each day may be gradually lengthened. The custom of allowing patients to sit quietly in a chair fifteen minutes on the first day out of bed is followed at the hospital, and they are not allowed to walk to and from the chair.

Conclusion. The statistics and clinical observations presented in this study seem to allow certain logical conclusions and obvious deductions that it is hoped will be of service to those who have to deal with this terrible yet fascinating disease. There can be no disease more

terrible than one which, uncontrolled, is capable of entering the home of the poor and the rich alike, and leaving the hearthstone desolate with only the bereaved parents, where once the happy voices of many children were heard. There can be no disease more fascinating than such a one as this over which science and the skill of the clinician have so nearly gained complete control. Yet during severe epidemics diphtheria formerly often claimed every child of a household as its victim. This series of cases, on the other hand, contains three and four and five members of some families, all of whom were discharged well. It is not an uncommon occurrence to have all of the children of a family under treatment in the hospital at the same time. It sometimes happens that one of the number dies; and the fatality almost invariably occurs in the first member of the family to contract the disease and the one from whom the others were infected. The poor and ignorant often fail to call a physician until it is too late for him to be of service to the child for whom he is called. But if the disease is diphtheria he often finds other children of the family also ill and their condition not recognized by the parents; and he may be in time to save their lives. The value and importance of an early diagnosis and prompt treatment are thus emphasized almost daily in any large hospital devoted to the treatment of this disease. The amount of toxin absorbed by a given patient is estimated with difficulty, and the rapidity with which it acts on the tissues of the body probably varies greatly; but when the nature and extent of the degenerative changes possible as a consequence of severe diphtheritic intoxication are considered there can be no doubt of the advisability of neutralizing the toxin in the shortest possible time. Clinical experience teaches that this can best be done by giving antitoxin early, in large doses, and at frequent intervals. When the nature and extent of the degenerative changes are considered the reasons for continued and prolonged rest in bed are also obvious, and the duty of the physican is plain. The various complications that may arise demand an untiring vigilance, but usually suggest their own treatment.

I wish to express my grateful appreciation of the character and quality of the work that has so long been done by Dr. McCollum, and of his untiring energy as a teacher. I also wish to thank him for his many personal kindnesses to me during my service at the Boston City Hospital, and especially for the patience and careful persistence with which he has led me into a knowledge of contagious diseases.

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OBSERVATIONS ON THE CHARACTER OF THE CELLS IN THE EXUDATION IN ACUTE INTERSTITIAL NEPHRITIS, WITH SPECIAL REFERENCE TO THE PRESENCE OF CELLS WITH EOSINOPHILIC GRANULATIONS.

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In 1897 Councilman[1] reported nine cases of acute interstitial nephritis, of which four occurred in individuals dead from scarlet fever, one from diphtheria and scarlet fever, two from diphtheria, one after criminal abortion, and in one case the initial lesion was unknown.

Councilman described the initial lesion as being an accumulation in the interstitial tissue of the organ of cells in every way similar to those seen in hyperplasia of connective tissue. Some of the cells he regarded as leucocytes, but they seemed to be derived in large part from the endothelium of the small veins and capillaries, but not from that of the arteries.

The cells of the connective tissue of the glomerular capsules were also said to take part in the process. The interstitial cell increase was both general and focal. A variable amount of degeneration of the renal epithelium was noted; but that was not regarded as the primary lesion, and was attributed in part at least to the pressure exerted by the cells in the interstitial tissue.

Cultures were made in five of the cases, and in all there was a general infection with the streptococcus, and in one case the diphtheria

[1] The American Journal of the Medical Sciences, vol. civ.

bacillus was also found. Œdema was absent and there were no symptoms pointing to disease of the kidneys.

In a second and more elaborate article on the subject in 1898, Councilman[1] states that in two and a half years he found 42 cases of acute infectious diseases in which acute interstitial nephritis was present. Of these cases 24 were diphtheria, 5 scarlet fever, 5 diphtheria and scarlet fever, 2 diphtheria and measles, 1 measles and whooping-cough, 1 empyema with subsequent diphtheria, 1 lobar pneumonia and pericarditis, 1 epidemic cerebro-spinal meningitis, 1 lobar pneumonia, and 1 acute endocarditis following abortion. Presumably the later series includes the nine cases mentioned in his first article. Bacteriological investigation of the kidneys resulted as follows:

In the 29 cases of pure diphtheria the kidneys were sterile in 6, the colon bacillus occurred in 11, the streptococcus pyogenes in 5, the B. diphtheriæ in 8, B. fœtidus in 1. In 5 cases of pure scarlet fever B. coli was found in 2, the streptococcus in 3, and the staphylococcus aureus in 1. Of 8 cases of mixed diphtheria and scarlatina and measles 2 were sterile, the streptococcus occurred in 3, and B. coli in 3. In the remaining 6 cases B. coli occurred in 3, the staphylococcus aureus in 2, the streptococcus in 4, the pneumococcus in 1, and 1 case was sterile. Bacteria were not found in hardened sections of the kidneys.

As the result of these observations Councilman concludes that "we cannot lay any weight on the presence of bacteria in the kidney as a constant factor in the acute interstitial lesion."

Beside the forty-two cases associated with general diseases, Councilman found three others in which the interstitial process was due to the local action of bacteria.

In the first case—one of ascending ureteritis and pyelonephritis—cultures gave B. coli and streptococci. About the necrotic areas there was an "intense infiltration of the tissues with plasma cells." These cells were also present in the surrounding vessels.

In the second case there were multiple small, hæmatogenous renal abscesses, secondary to carbuncle of the neck and thrombosis of the lateral sinuses, with the staphylococcus aureus in pure culture. In the typical abscesses there were micrococci, a mass of pus cells, and nuclear detritus. Outside of the abscesses there were a number of large epithelioid cells, many of which contained micrococci and other cells, and outside of this cell layer there was an intense infiltration with plasma cells, which were also present in the bloodvessels.

In the third case—one of scarlatina with abscess beneath the scalp and general infection with the staphylococcus aureus—there was general interstitial nephritis and small abscesses with surrounding plasma-cell infiltration.

[1] Journal of Experimental Medicine, 1898, vol. iii., Nos. 4 and 5.

In this article Councilman gives an extensive review of the literature of acute interstitial nephritis. It is neither profitable nor advisable to repeat this in the present paper, but I will refer the reader to Councilman's article. He shows that acute interstitial nephritis was first described in a case of scarlatina by Biermer in 1860. Since then it has been described by a number of authors as occurring chiefly in scarlatina, diphtheria, typhoid fever, and acute infections. Some authors regard it as the most characteristic lesion of scarlatinal nephritis.

A review of the articles quoted by Councilman shows that the cells in the interstitial process have been regarded as lymphocytes by Biermer, Wagner (who describes the process as "lymphomatous nephritis"), Klebs, Coats, and Klein. Litten and Von Kahlden called them leucocytes. They are referred to as "round cells," or "small round-cell infiltration," by Weigert, Waller, Dunin, Fischl, Friedlander, Neuwerck, Langhans, Litten, Oertel, Sörensen, Baginsky and Stamm, Bernard and Felsenthal, and Rosenstein. Kelsch regards them as embryonic in character.

Coats and Neuwerck believe that they are derived from the bloodvessels, while Crooke states that they are derived from the blood as well as from proliferation of the endothelium of the capillaries. Orth states that the interstitial cells are not similar to leucocytes, and have a round, vesicular nucleus. He thinks they are derived from connective-tissue cells, but says their relation to the small veins speaks in favor of emigration.

Councilman defines acute interstitial nephritis as "an acute inflammation of the kidney, characterized by cellular and fluid exudation into the interstitial tissue, accompanied by but not dependent on degeneration of the epithelium; the exudation is not purulent in character, and the lesions may be both diffuse and focal."

The foci are found chiefly in three places—the boundary zone of the pyramids, the subcapsular region of the cortex, and around the glomeruli. In some cases the bloodvessels of the boundary zone contain numbers of lymphoid cells and plasma cells. Councilman gives a clear description of the cells in the interstitial tissue and identifies them with Unna's plasma cells, of which he gives an historical sketch. He agrees with Marschalkó, that these cells are derived from lymphocytes. He states that the plasma cells in the interstitial tissue come partly from the bloodvessels, through the walls of which their passage can be traced, and partly from mitotic division of the emigrated cells. The latter may emigrate, either as lymphoid cells or as plasma cells. Variable numbers of both of these varieties of cells are found in the bloodvessels. The interstitial cells lie in larger and smaller groups between but never in the tubules, upon which they often exert considerable pressure. Councilman found nuclear figures in plasma cells in the bloodvessels as

well as in the tissues, where they were often very numerous. In marked cases other kinds of cells were found in the interstitial tissue. Of these the most common were lymphoid cells, the transition of which into plasma cells could often be traced. "Polynuclear leucocytes" (presumably neutrophilic, but whether neutrophilic or eosinophilic is not stated) were "usually present in variable numbers, depending upon the degree of degeneration of the epithelium."

In addition to these varieties, in a few instances, large phagocytic cells of the epithelioid type were seen. Councilman believes these cells to be derived from the tissue cells. They may contain red blood-cells, leucocytes, and plasma cells. The epithelium showed cloudy swelling and fatty degeneration in variable degree, and in some cells vacuoles and globular hyaline masses were found. Some tubules were markedly dilated and some entirely destroyed. There were usually no glomerular changes, although acute interstitial nephritis was sometimes met with as a complication of typical glomerulo-nephritis. Leucocytes were sometimes found in the tubules.

SUMMARY. The cells in acute interstitial nephritis have been described by various authors as "lymphoid cells," "small round-cell infiltration," "leucocytes," and have been thought to have their origin in (1) the bloodvessels (emigration), (2) proliferation of the vascular endothelium, (3) from the fixed connective-tissue cells of the part. Councilman, the latest and most exhaustive writer on the subject, finds the most numerous cells to be the plasma cells, but finds that lymphoid cell (lymphocytes) and polynuclear leucocytes are also present in variable numbers.

These cells are all derived from the bloodvessels, whence they emigrate into the interstitial tissue. He traces the origin of the plasma cells from lymphocytes, and for the first time demonstrates their active mitotic division in the tissues and bloodvessels. He also points out their highly developed amœboid activity. Councilman further describes the presence of large epithelioid phagocytic cells.

REPORT OF CASES. During the last two years, in the routine examination of my autopsy material, I have met with the following cases of typical acute interstitial nephritis:

CASE I. *Summary: General streptococcus bacteriæmia after abortion; marked acute interstitial nephritis, with large numbers of plasma cells; polymorphonuclear eosinophiles and a few lymphocytes in the exudation.*—M. A., female, aged thirty-five years, entered Lakeside Hospital, December 7, 1898, and died the next day. There was a history of recent abortion. There were no symptoms pointing to the kidneys.

Autopsy, Sixteen Hours after Death. Anatomical diagnosis: Ulcerative stomatitis, acute pharyngitis, laryngitis, bronchitis, and bronchopneumonia, congestion and œdema of the lungs; acute interstitial nephritis, fatty degeneration and cloudy swelling, with bile pigmentation of the

liver and kidneys. Acute splenic tumor, syphilitic cirrhosis of the liver. Retained placenta after abortion. Streptococcus bacteriæmia. Infection of the uterus with the streptococcus and B. mucosus capsulatus. Gaseous emphysema of the gall-bladder, due to B. aërogenes capsulatus.

The kidneys were enlarged, the right weighing 370 and the left 330 grammes. The capsules were readily removed; the surfaces were smooth, but deeply stained with bile-pigment. On section, both organs presented the same appearances; they were markedly œdematous and congested, and a large amount of serum and blood escaped on section. The cortices were thickened, averaging 1 cm. in thickness, and denser than ordinary. The glomeruli were inconspicuous. The cut surface was pale and opaque. The medullary as well as the cortical portion was deeply stained with bile-pigment. The pelves, ureters, and vessels were normal. The adrenals were normal.

The description of the other organs is without present interest.

Cover-slips from the uterus and lungs showed streptococci in short chains. Aërobic agar plate cultures from the lungs, pleura, spleen, and kidneys showed the streptococcus pyogenes in pure culture; those from the uterus showed the streptococcus and B. mucosus capsulatus. Cover-slips and animal experiments from the gaseous emphysema about the gall-bladder showed B. aërogenes capsulatus.

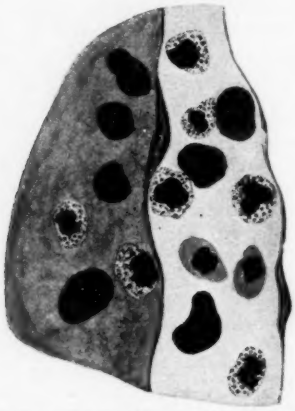
Histological Examination of the Kidneys. Portions of the various organs were hardened in Zenker's fluid, embedded in paraffin, sectioned, and stained in hæmatoxylin and eosin and in eosin and Unna's alkaline methylene-blue.

Kidneys. Glomeruli: The capillaries are dilated and contain large numbers of red blood-cells and occasional polymorphonuclear eosinophiles and plasma cells. No changes can be made out in the capillary walls. The capsular epithelium of the glomeruli is swollen, granular, and occasionally desquamated. Bowman's capsules are unchanged. The epithelial cells of the convoluted tubules are swollen and granular and desquamated in many places. Some tubules contain coarsely granular material, which stains intensely with eosin. In the convoluted tubules a few of the epithelial cells contain nuclear figures. Some tubules contain many cells.

There are everywhere signs of marked œdema of the interstitial tissue. The most marked changes are seen in the interstitial tissue between the tubules and along the course of some of the arteries and veins. About many of these, especially the interlobular vessels near the medulla and in the intermediate zone, the adventitia coat and the perivascular fibrous tissue are infiltrated with large numbers of cells—plasma cells, lymphocytes, large mononuclear leucocytes, and polymorphonuclear and mononuclear eosinophiles (Fig. 1). The proportion between the various cells varies greatly, but in general the plasma cell is the most numerous cell, and often there are large numbers of eosinophiles. In some places these latter form at least one-third of the cells present and in others they are the most numerous cells in the exudation. The same cells are often seen in the media of small arteries and veins, the lumina of which commonly show larger and smaller numbers of the same cells. Plasma cells and eosinophiles are often present in large numbers in the intertubular capillaries, and sometimes also in the glomerular capillaries. No endarteritis is to be found. The bloodvessels in general contain variable numbers of plasma cells and eosinophiles. Scattered

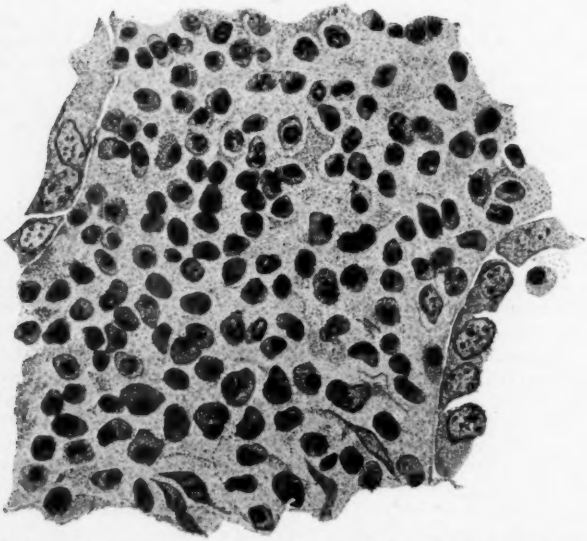
throughout the cortical portion of the organs, often in association with the arteries and veins, as above described, but often at a distance from

FIG. 1.



Capillary and surrounding tissue, showing plasma cells, large mononuclear leucocytes, and eosinophiles. The last named are distinguished by their granular protoplasm.

FIG. 2.

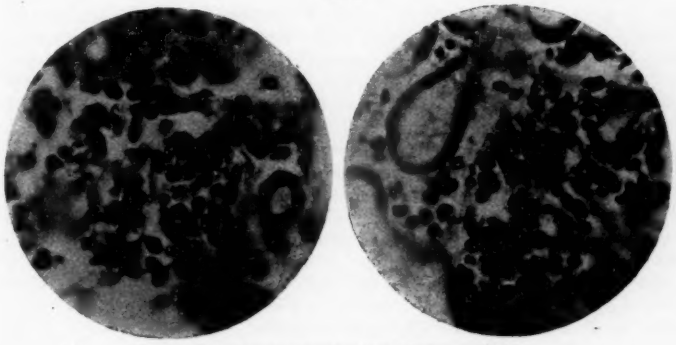


Intertubular exudation of plasma cells, mononuclear leucocytes, and eosinophiles. The cells with coarsely granular protoplasm are eosinophiles.

these, there are a large number of areas of intertubular cellular infiltration. Here the tubules are compressed to a greater or lesser degree, and are often entirely obliterated. These areas are very numerous in the peripheral portion of the cortex, but are most numerous near the medulla. In general, the cells of these areas are of three kinds—plasma cells, lymphocytes, and eosinophiles—while large mononuclear leucocytes are sometimes seen (Figs. 2 and 3).

The plasma cells are sometimes round, sometimes oval or long oval, and often very much elongated. Judging from their shape, many had evidently been actively motile. Their nuclei are distinctive, with well-marked rim, from which often projections extend into the interior of the nucleus, where in many cells densely staining chromatin masses were seen. In most cells the nuclei are placed eccentrically. The cytoplasm usually, but not invariably, stains a bluish hue with the methylene-blue. In some places transitional forms between lymphocytes and plasma cells are seen in both the bloodvessels and the tissues. In some cells there are two, and in a few even three, nuclei. Mitotic figures are often seen in the plasma cells.

FIG. 3.



Photomicrographs showing intertubular exudate.

The eosinophiles of the bloodvessels as well as of the tissues are almost invariably of the polymorphonuclear type, with coarse, eosinophilic granulations. Comparatively few mononuclear forms are present. No transitional forms between mononuclear leucocytes, lymphocytes, or plasma cells are found. The eosinophiles in the kidneys in this case were evidently brought there by the blood and were not formed locally. The cells in the areas of the infiltration were evidently derived from the bloodvessels—a true exudation. No bacteria were found in sections of the kidney.

CASE II. *Summary: Unsuspected acute interstitial nephritis, with plasma cells and mononuclear and polymorphonuclear eosinophilic leucocytes in the intertubular exudation; tuberculosis of the bronchial glands, with eosinophiles in the tubercular tissue; prolapsus uteri; abortion; vaginal hysterectomy.*—Mrs. E. C., white, aged thirty years, was admitted to Lakeside Hospital, service of Dr. Hunter Robb, December 10, 1898, exhibiting labor pains. She had had measles and malaria some time

before. She had had prolapsus uteri for some time. She has one child, aged five years; aborted at the fifth month about two years ago, and had a full-term child fourteen months ago. Her urine examined on the day of admission was straw-colored, with specific gravity 1018, and free from albumin and sugar. In the slight sediment there were amorphous urates, a few epithelial cells, and some leucocytes. A blood-count made December 19th showed 3,950,000 red blood-cells and 24,000 leucocytes per c.mm. A differential count of the latter was not made.

Operations. December 19th, curettement and irrigation of the uterus to remove abortion remnants. December 28th, vaginal hysterectomy with removal of the right ovary and tube. Convalescence was uninterrupted until her sudden death, eighteen days after the last operation, and the day before the one set for her discharge from the hospital.

Anatomical diagnosis: Hypoplasia of the cerebellum, cyst of the pia arachnoid at the base of the brain. Acute interstitial nephritis; small stitch abscess of pedicle.

Cover-slip preparations and plate cultures from the various organs, including the kidneys, were negative. From a small stitch abscess in the pedicle a few colonies of the staphylococcus aureus grew.

Portions of the organ were hardened in Zenker's and in Orth's fluids and in alcohol. Sections of the kidneys were embedded in paraffin and stained in hæmatoxylin and eosin, and in eosin and in Unna's alkaline methylene-blue. The bronchial glands and the kidneys being the only organs of present interest, a description of the macroscopical and microscopical appearances of the other organs will be omitted.

Kidneys. The right kidney weighed 175 grammes, and measured 11 x 6 x 4 cm.; the left weighed 145 grammes, and measured 10 x 6 x 4 cm., otherwise they were exactly alike.

The capsules were readily removed. The surfaces were smooth and showed numerous irregular, small, pale areas. On section, both organs were markedly congested, but not specially œdematous. In the cortex the glomeruli were inconspicuous. The cut surface was moderately glistening. Scattered through the cortices there were a large number of small, pale, white areas; in these places the consistency was somewhat increased. The medullæ were congested, otherwise normal. The pelves, ureters, arteries, and veins appeared normal.

Microscopical Appearances of the Kidneys. The capsules were somewhat thickened. The glomeruli were normal in appearance. The epithelial cells of the convoluted tubules were granular and in some places contained vacuoles. Scattered throughout the cortex, but best marked at the periphery and in the so-called intermedial zone, there were larger and smaller areas of cellular infiltration. These areas varied from a few to several micromillimetres in size. In general they were round or long and oval in outline. They often surrounded a glomerulus, the capillaries of which are dilated, sometimes thickened, and contained an increased number of cells, some of which were typical eosinophiles. The glomerular spaces were free from cellular or other exudation. There was no desquamation of the capsular epithelium. The cell accumulations were almost entirely intertubular, but in many places cells were grouped about the glomerular capsules. The tubules in these areas were often markedly compressed, and a few were dilated and contained cells similar to those found in the intertubular tissue. There was very little change to be made out in the tubular epithelium, even in the

largest areas of cell infiltration. The plasma cell was the most numerous cell in these areas, but a large proportion of the cells were lymphocytes, and there were a considerable number of large mononuclear leucocytes. In some places there were many typical coarsely granular eosinophiles, some mononuclear, others polymorphonuclear. The capillaries in these areas were usually dilated, often markedly so. They contained large numbers of leucocytes, but few erythrocytes. The proportion between the various kinds of leucocytes was about the same as in the tissues. The plasma cells and eosinophiles often outnumbered the other cells in the dilated capillaries. In some places the capillaries distended by these cells compressed the tubules. Sometimes the perivascular spaces between the tubules and the distended capillaries were crowded with cells similar to those contained in the latter. No nuclear figures were seen in cells in the capillaries. Many of the small veins contain an increased number of leucocytes. The cells in the interstitial tissue evidently came from the bloodvessels. Here and there nuclear figures could be made out in the plasma cells in the intertubular tissue. The proportion of lymphocytes in the capillaries and in the interstitial tissue was greater in this case than in the other two. The adventitia coat and the perivascular tissue of some of the interlobular arteries showed infiltration with plasma cells, lymphocytes, and eosinophiles.

No transition of eosinophiles from plasma cells or mononuclear leucocytes could be traced in this case. The eosinophiles were nearly as numerous in the capillaries as in the interstitial tissue. They certainly were in large part, if not exclusively, brought to the part by the bloodvessels. These cells were very numerous in the interstitial exudation in this case; in some places from ten to fifteen could be counted in a single field of the oil-immersion lens. No eosinophiles could be found in sections of the uterus, ovaries, or tubes. The only other organs in the body in which these cells were found was in a tuberculous bronchial gland, in the lymph-channels and stroma, of which large numbers of eosinophiles were found.

No bacteria were found in the hardened sections of the kidneys.

CASE III. *Summary: Death from bronchopneumonia secondary to otitis media; unsuspected acute interstitial nephritis, with plasma cells, lymphocytes and eosinophiles in the exudation.*—A female child, aged six weeks, died at St. Anne's Hospital, service of Dr. Thomas, after a few days' illness with otitis media and bronchopneumonia. The body was sent to the laboratory for autopsy.

Anatomical diagnosis: Acute bronchopneumonia (slight) of both lungs; otitis media of the left side. Congestion of the lungs, liver, spleen, and brain. Fatty degeneration of the liver. Marked œdema of the kidneys, with acute interstitial nephritis.

Cultures from the lungs showed large numbers of streptococci in pure culture; from the left middle ear streptococci and B. mucosus capsulatus. Cultures from the other organs were negative.

The right kidney weighed 55 grammes, the left 65 grammes. They were of the same general appearance. The capsules were easily removed; the surfaces were smooth. On section, both organs were uniformly very pale, almost white in color. The consistency was soft, and there was extreme œdema. The cortices were swollen. The pelves, cortices, and ureters were normal. No focal changes were discerned on macroscopical examination.

The gross description of the other organs is without present interest.

Kidneys. Portions of the organ were hardened in Orth's fluid, cut in paraffin, stained in hæmatoxylin and eosin and in methylene-blue and eosin.

Glomeruli: The glomeruli for the most part filled the capsules, which were not thickened. The glomerular capillaries were often dilated and contained red blood-cells, large mononuclear leucocytes, lymphocytes, and often typical plasma cells. The epithelial cells covering the capillary walls and Bowman's capsule showed no special changes. In a few capsular spaces there were a few mononuclear leucocytes and plasma cells and some finely granular material.

Tubules: The epithelial cells of the convoluted tubules showed in places moderate cloudy swelling. Some of the tubules contained granular material. Here and there tubules, especially the straight tubules and the tubules of the pyramids, contained larger and smaller numbers of plasma cells, lymphocytes, large mononuclear leucocytes, and occasionally eosinophiles. In a few places there was desquamation of some tubal epithelial cells. A few renal epithelial cells showed nuclear figures and contained leucocytes. There were no focal areas of necrosis.

Interstitial tissue: The interstitial tissue of the cortex showed the most marked changes. Here the structures were often widely separated, evidently by œdema. Here and there large and small areas of cellular infiltration of the intertubular tissue were seen. These areas varied very much in number and extent in different sections; they were often most numerous in the superficial layer of the cortex; in other places they were numerous in the intermediate zone. In still other sections they were rather evenly distributed through the cortical substance. They were often found about glomeruli, which were, however, unchanged or, at most, were compressed. These areas of infiltration varied in shape; about the glomeruli they were usually somewhat crescentic in outline; when between tubules they were often elongated or oval; while about branches of the interlobular arteries they were either round or elliptical in shape. These areas varied very much in size, from a few cells to areas of 100 or 200 micromillimetres in diameter. These cells lay in the intertubular tissue, in the bloodvessels, and in the media and adventitia coats of arteries. By far the most common cell in the infiltration was the plasma cell. A few large mononuclear leucocytes and typical lymphocytes were seen.

There was a variable number of coarsely granular eosinophiles, both in the areas of cellular infiltration and in the capillaries. These cells usually had densely staining nuclei, which were often trilobate. In some the nucleus was similar to that of the typical plasma cell. One elongated cell with eosinophilic granulations had a plasma-cell nucleus at each end of the cell. Here and there pictures were seen which suggested that eosinophiles had developed from plasma cells, but it was apparent that most of the former had emigrated from the bloodvessels.

In many cells with cytoplasm like that of plasma cells nuclear figures were seen. Many of the areas of interstitial infiltration were situated about small arteries, afferent and efferent vessels, as well as interlobular arteries. The same cells described in the intertubular exudation were found in the adventitia and perivascular spaces of the vessels.

The periarterial infiltration was a marked feature of the process.

In the medullary portion of kidneys the capillaries were congested, and here and there small areas of cellular infiltration were found. A few eosinophiles were found in the mesenteric glands, the thymus, and the stroma of the mucosa of the intestines.

In the above cases of interstitial nephritis, two occurring after abortion—in one instance with general streptococcus infection; in the other no micro-organisms being demonstrated, and in the third bronchopneumonia and otitis media of streptococcus origin—I have been able to confirm in every respect the observations of Councilman on the character and origin of the cells in the interstitial exudation. I have further met with a cell not hitherto described in renal exudates, namely, the eosinophilic leucocyte. This cell was very numerous in the interstitial exudation in two cases (I. and III.), and in one case (I.) in many places it was the most numerous cell present. In two cases the presence of this cell in the exudation appeared to be due solely to emigration from the bloodvessels, while in one case (III.), in addition to this, it was evidently also due to transition from plasma cells in the interstitial tissue.

I have also been able to confirm Councilman's observation of the presence of plasma cells in the bloodvessels and the mitosis of these cells. There can be no doubt that they possess amœboid activity to a high degree.

In addition to these cases of typical acute interstitial nephritis, the records contain three other cases of interest in this connection. The first case was one of chronic interstitial nephritis with marked connective tissue increase. Beside the small round cells (lymphocytes?) plasma cells and mononuclear and polymorphonuclear eosinophilic cells were found in considerable numbers in the areas of cellular infiltration.

The second case was one of hemorrhagic cystitis, prostatic abscess, pyelonephritis, chronic arterio-sclerotic nephritis, and gaseous emphysema of the kidneys and liver. Cultures from the kidneys showed the streptococcus, B. coli, and B. aërogenes capsulatus. Sections of the kidneys hardened in Zenker's fluid, cut in paraffin, and stained with eosin and methylene-blue showed, beside well-marked arterio-sclerotic nephritis, multiple abscesses and larger and smaller areas of cellular infiltration without tissue necrosis. In the abscesses there was always a central area of necrosis surrounded by polymorphonuclear leucocytes, plasma cells, and eosinophiles, the polymorphonuclear neutrophile being the most numerous cell. Many cells were found in the neighboring tubules as well as in the interstitial tissue. In these areas there were cocci, short, thin bacilli, and large numbers of long and short, stout bacilli, corresponding respectively to the streptococcus, B. coli, and B. aërogenes capsulatus obtained in cultures. Beside these areas of abscess

formation, scattered throughout the sections, but most numerous in the deep cortical and medullary portions, there were larger and smaller areas of diffuse interstitial nephritis, with plasma cells, polymorphonuclear, neutrophilic and eosinophilic leucocytes. Similar cells were seen in the dilated vessels. These areas were free from tissue necrosis.

In the third case there were acute and chronic interstitial nephritis, with small abscesses and epithelioma of the bladder. Cultures from the genito-urinary as well as the other organs were sterile. Urotropin had been taken for some days before death. In addition to the marked chronic interstitial nephritis and small abscesses (where the polymorphonuclear neutrophilic leucocyte was the most common cell), there were a number of areas of cellular infiltration of the interstitial tissue without changes in the epithelium. The cells in these areas were plasma cells, lymphocytes, and eosinophiles. In the adventitia of one of the small arteries there were numbers of plasma cells and eosinophiles.

In the first of the three last-mentioned cases the areas of cellular infiltration probably represented simply an acute exacerbation or spreading of the chronic process. The last two cases, however, very closely resemble the very similar ones reported by Councilman on page 416 of his monograph.

Etiology of Acute Interstitial Nephritis. Consideration has already been given to the bacteriological examination of the kidneys in acute interstitial nephritis. As a result of his work Councilman concludes that bacteria play no part in the etiology of this affection, for in many cases cultures are sterile, and in the cases where organisms are found they are of various kinds, and no bacteria can be demonstrated in the hardened sections. In our three cases there was general streptococcus infection after abortion in one case; in one case there was otitis media and bronchopneumonia, due to streptococci, and in the other case no bacteria grew except a very few staphylococci from a small stitch abscess. Both Councilman and I have, however, found acute interstitial nephritis in kidneys the seat of suppurative processes, in which staphylococci, streptococci, B. coli, and B. aërogenes capsulatus were found. Councilman concluded that no adequate explanation has been offered for the focal lesions in the kidneys, but thinks that physical conditions of the circulation may be concerned in the accumulation of cells in certain places, and that the interstitial foci may be due to the presence of soluble substances exerting a positive chemotaxis for the cells.

It seems to me that the latter is the correct explanation. This process occurs especially in diseases due to or which are commonly subject to mixed infection with micro-organisms which produce powerful toxins —notably B. diphtheriæ and streptococci. It seems probable, judging from the comparatively slight changes in the renal epithelium, that the

toxins in the kidneys in these cases are much diluted, and instead of producing wide-spread tissue necrosis with abscess formation, they attract to themselves and cause to multiply in the interstitial tissues and in the neighboring bloodvessels cells of the same character whose proliferation they stimulate in the hæmotopœtic organs; for, as Councilman and Pierce have shown in scarlet fever and diphtheria, great numbers of plasma cells are formed in the bone-marrow, spleen, and lymph-glands. I have observed the same thing in diphtheria.

In a large number of inflammatory and other processes, notably in infections caused by the streptococcus, the gonococcus, and the tubercle bacillus I have observed a large increase of plasma cells and eosinophiles in the lymph-glands and even the spleen. I have traced the development of plasma cells into eosinophiles with typical granulations in a variety of tissues and conditions, and have elsewhere called attention to this fact.[1] These observations will be reported in detail in another article.

Conclusions. I have been able to confirm Councilman's observation of the occurrence (1) of plasma cells, lymphocytes, polymorphonuclear leucocytes in acute interstitial nephritis. (2) The presence of lymphocytes and plasma cells in the dilated vessels. (3) Mitosis and evident amœboid activity of plasma cells in both bloodvessels and tissues.

In addition to the cells described by previous authors I find large numbers of typical eosinophilic leucocytes in the interstitial exudation and in the bloodvessels in acute interstitial nephritis. In some places in one case these were the most numerous cells in the exudation.

The eosinophilic leucocytes in the lesions of acute interstitial nephritis are for the most part brought to the part by the bloodvessels and reach the interstitial tissue by emigration, but there is evidence (in one case) that they may be formed locally from plasma cells. The large phagocytic cells were not found in my cases.

My thanks are due to Dr. R. G. Perkins for the photomicrographs and to D. W. Whitcomb for the drawings.

RARE CARDIAC ANOMALIES.

CONGENITAL AORTICO-PULMONARY COMMUNICATION; COMMUNICATION BETWEEN THE AORTA AND THE LEFT VENTRICLE UNDER A SEMILUNAR VALVE.[2]

By Ludvig Hektoen, M.D.,
of Chicago.

In the following will be described two decidedly uncommon defects —one of the septum between the pulmonary artery and the aorta, and

[1] Philadelphia Medical Journal, December 19, 1899.
[2] Read before the Chicago Pathological Society, November 11, 1900.

the other of the base of the right anterior aortic valve, the latter being, as far as I can tell, absolutely unique. The patients, two new-born infants, died in the Presbyterian Hospital while under the care of Prof. Cotton, and the post-mortems were made in my laboratory. Both cases have been previously recorded by Prof. Cotton,[1] but with especial reference to certain clinical manifestations, particularly anuria, hence the reason for this additional report.

I. *Large defect in the septum between the pulmonary artery and the aorta, the heart normally developed; general infection with B. mucosus capsulatus. Post-mortem* (675).—Well-developed, fairly well-nourished male infant, 51 cm. long, weighing 2657 grammes. There are no external malformations. The surface of the body, both anteriorly and posteriorly, is bluish-red in color. The umbilical cord is dry and separating at the navel. The abdomen is somewhat distended.

The abdominal cavity is empty, the lining smooth. The diaphragm reaches to the fifth right and sixth left ribs.

The pleural cavities are empty and smooth as to lining, the visceral pleura being the seat of many hemorrhagic extravasations.

The pericardium is also smooth, the cavity contains a small amount of clear fluid.

The mouth, pharynx, larynx, trachea, and œsophagus are normal. The thyroid is of usual size; the thymus rather small.

The lungs are fully distended and show many small, deeply-congested spots throughout the parenchyma; no bronchitis.

The heart presents a much larger right than left ventricle; the latter is situated more behind the right than usual. The walls of the two ventricles are of about the same thickness, but the cavity of the right ventricle is much the larger. The tricuspid and mitral valves are quite normal; the pulmonary and aortic valves are also well formed and normal. There is an oval defect, about 1.5 cm. in its greatest diameter, between the pulmonary artery and the aorta, so that a little above their beginning the aorta and the pulmonary artery have a common trunk from which emerge in the usual places, relatively, the right and left pulmonary arteries and the branches of the arch of the aorta (Fig. 1). The greatest diameter of this common trunk is 3 cm. Between the semilunar valves arises a septum with a somewhat rounded, concave upper margin; from the base of the pulmonary semilunars the septum rises to a height of 3 mm., while from the base of the aortic semilunars the septum is 1 cm. high. The ductus arteriosus is fully patent and quite large, and the part of the aorta distal to the duct is wider than the transverse part proximal to the duct. The foramen ovale is widely open. The veins—pulmonary and caval—are quite normal. The ventricular septum is normal.

The stomach and intestines are normal.

The pancreas is normal.

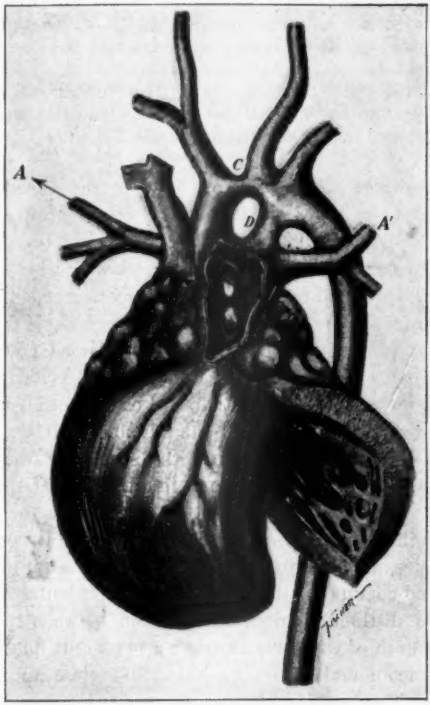
The liver and spleen are congested, the liver being soft and mottled, yellow and red. The spleen weighs 10 grammes, the liver 110 grammes. The adrenals are normal, weighing 11 grammes.

The uro-genital organs are normally formed and situated. The

[1] Arch. of Pediatrics, 1899, xvii. 774-778, and 1900, xviii. 781-786.

bladder contains a small amount of turbid urine, the mucous membrane immediately about the ureteral orifices is swollen and red. There is no dilatation of the ureters and pelvis. There is marked uric-acid infarction in both kidneys with some congestion of the pyramids. The kidneys weigh 26 grammes.

FIG. 1.



Aortico-pulmonary communication.

A, right pulmonary artery. *A'*, left pulmonary artery. *B*, opening of aorta from left ventricle into common trunk. *C*, partial obliterated aortic arch. *D*, large patent ductus arteriosus. *E*, hypertrophied right ventricle.

The brain and its membranes are normal; weight, 1381 grammes. The lines of ossification are even and regular; Bichat's centre measures 4 mm.

Bacteriological Examination. Smears and cultures from the heart's blood, the lungs, the liver, the spleen, and the kidneys all show a bacillus with the morphological, cultural, and pathogenic characteristics of bacillus mucosus capsulatus.

Histological Examination. The heart shows normal structural conditions.

The lungs are the seat of an extensive hemorrhagic infarction, the alveoli and bronchioles in places being filled to distention; otherwise no changes.

The liver is the seat of a marked passive congestion with fatty infiltration of the liver cells and some recent increase in the periportal connective tissue, which is rather cellular.

The cortex of the kidney shows cloudy swelling of the epithelium of the convoluted tubules. In the medulla the uriniferous tubules are crowded full with a granular material which stains light blue with hæmatoxylin; the epithelial lining is intact and the vessels uniformly distended with blood.

Sections stained with methylene-blue show occasional encapsulated short bacilli here and there in all the organs, especially among extravasated corpuscles and in the capillaries of the lungs.

Instances of direct communication between the aorta and the pulmonary artery, caused by congenital defect in the septum of the arterial trunk, are described by Elliotson,[1] Wilks,[2] Fräntzel,[3] Baginsky,[4] Cæsar,[5] Girard,[6] and Richards;[7] Rauchfuss[8] and Gerhardt[9] also each mention an instance. These seem to be all the instances recorded in literature. The defect is rare. Virchow, in discussing Baginsky's case, remarked that he had not seen an example before. As far as I have been able to learn, there is no previous instance recorded in American literature.

In all these instances (except Richards' case) there is a simple communication between the aorta and the pulmonary artery, the opening being situated a short distance above the semilunar valves, round or triangular in outline, and 10 to 12 mm. in diameter. Other malformations are not noted, and evidences of endocarditis or angeitis are wanting altogether. This form of communication is consequently of congenital nature, and it is to be distinguished from the more frequent, similarly located communications of acquired, accidental origin.[10] It is also to be held distinct from communication between the pulmonary artery and the arch of the aorta through a persistent ductus arteriosus, which, when uncommonly short, may lead to a close approximation of the two vessels. The location of this communication would be different, namely, at the arch of the aorta.

[1] Lancet, 1830.

[2] Transactions London Pathological Society, 1859, vol. ii. p. 59.

[3] Virch. Arch., 1868, vol. xliii. p. 420

[4] Berl. klin. Wochenschr., 1879, p. 439.

[5] Lancet, 1880, vol. ii. p. 768.

[6] Ueber einen Fall von congenitaler Communication zwichen Aorta u. Arteria pulmonalis. Zurich, Dissertation, 1895.

[7] British Medical Journal, 1881, vol. ii. p. 71.

[8] Gerhardt's Handbuch der Kinderkrankheiten, 1878, iv., Abth. i., p. 61, note.

[9] Lehrbuch der Kinderkrankheiten, 1874, vol. i. p. 244.

[10] See L. Brocq, Étude sur les communications entre l'aorta et l'artère pulmonaire autre que celles qui résultant de la persistance du canal artérial. Revue de Médecine, 1885, vol. v. pp. 1016-1056; 1886, vol. vi. pp. 786-816.

TABLE OF CASES.

No.	Author.	Age.	Sex	Clinical symptoms.	Description of defect.	Ductus arteriosus.	Remarks.
1	Elliotson	Young	F.	.....	Opening admitted end of finger.	Closed	No other anomalies.
2	Wilks	8 mo.	...	Strong systolic bruit at base; no cyanosis; ascites.	Opening admitted goose-quill.	Closed	Pulmonary artery large, aorta small; no trace of inflammation; no other anomalies.
3	Fräntzel	25	F.	Dyspnœa and palpitation as long as she had memory. Increased cardiac dulness; dropsy; cyanosis; changing auscultatory phenomena; at first systolic and diastolic murmur; later diastolic murmur was replaced by double tone; diastolic murmur same distribution as in aortic insufficiency.	1 cm. above margin of aortic valves a round opening 12 mm. in diameter.	Closed	Dilatation and hypertrophy of heart; right pulmonary artery originated from aorta just below arch; coronaries normal; no endocarditis; thrombi in left ventricle; innominate, common carotid, vertebral and left subclavian given off by arch; anasarca. (Post-mortem by Cohnheim.)
4	Baginsky	4 yrs.	F.?	Under observation since 8 days after birth; there was cough, dyspnœa, hoarseness, cardiac irregularity, systolic and diastolic murmurs, and repeated disturbances of compensation; scarlet fever and nephritis. Death from whooping-cough.	Opening between aorta and pulmonary artery 1 cm. in longest diameter; margins somewhat thickened; almost triangular in outline; base on level with upper border of left pulmonary semilunar valve and 5 cm. above free margin of aortic valves.	Closed	Parenchymatous nephritis; hypertrophy of both ventricles, more of the right, the left being the one most dilated.
5	Gerhardt	5 mo.	F.	No details except rough sound over heart.	Rounded opening with sharp margins.	.....	No endocarditis; specimen in Museum of Guy's Hospital.
6	Rauchfuss	Nursling	...	No details.	No details.	Closed	
7	Cæsar	9 yrs.	M.	Cyanosis since three months. Passed through measles, bronchitis, pneumonia; otitis 1-3 year; right hemiplegia since 5; died at 9 in convulsions; no murmurs.	Communication between aorta and pulmonary artery size of a sixpenny.	Not tated	Marked fenestration of aortic valves; ascending aorta as large as that of an adult; pulmonary and meningeal tuberculosis; large chronic abscess with calcareous mass in left hemisphere.
8	Girard	37	M.	Smallpox at 1; dyspnœa and cardiac distress since then; otitis; severe fever at 20, with swelling of legs; also other illnesses. Four years before death: dyspnœa and hæmaturia; systolic murmur with accentuation of 2d sound. Clinical diagnosis; mitral insufficiency, renal embolism, hæmaturia. Shortly before death: dyspnœa, cyanosis, gallop rhythm, enlargement of heart.	11 mm. above free edge of aortic valve opening into pulmonary artery 10 mm. in diameter; no change in intima of aorta and pulmonary arteries.	Not stated, probably closed	Heart weighed 670 grammes; hypertrophy especially marked of right side thrombus in apex of right ventricle; endocardium normal; coronary orifices large; extensive congenital tuberculosis.

No.	Author.	Age.	Sex	Clinical symptoms.	Description of defect.	Ductus arteriosus.	Remarks.
9	Richards	30	M.	Brassfounder until three months before death. Two loud, systolic and diastolic murmurs; hypertrophy of heart; dyspnœa; anasarca.	Behind larger of bicuspid aortic valves circular opening into pulmonary artery admitting little finger; margins membranous, smooth; passage somewhat funnel-shaped.	Not stated	Hypertrophy and dilatation of heart; no endocarditis; pulmonary artery dilated above opening from aorta; defective interventricular septum.
10	Cotton-Hektoen	3 days.	M.	"Blue baby." Anuria.	Oval defect 1.5 c.m. in its greatest diameter in septum above semilunar valves.	Patent, rather large	Foramen ovale open; no other defects; right ventricle hypertrophied.

Closely related to direct congenital communication between the pulmonary artery and the aorta is congenital communication between the beginning of the aorta and the right ventricle. Such cases are described by Cayla,[1] Charteris,[2] and Livingston.[3] In Cayla's case (man, aged thirty four) a canal passed from the upper part of the ventricle into the aorta just above the valves, which was somewhat irregular. Quenu suggests that the defect was caused by failure of union between the septum of the bulb and the interventricular septum. Charteris describes an opening "immediately under" the right valvular aortic curtain communicating with the right ventricle. This occurred in a man, aged fifty-three years, and perhaps a question might be raised as to its congenital nature.

Livingston's case occurred in a child four months old. Just at the beginning of the aorta a communication led into the right ventricle. There were only two aortic valves. White[4] and Tate[5] also describe somewhat similar defects. Lediberder's[6] case was more complicated. Here there was pulmonary stenosis, closed foramen ovale, open ductus arteriosus, and communication between pulmonary artery and aorta. I have not looked up the details.

In White's case (boy, aged fifteen years) the whole upper septum was deficient in thickness, and there was failure of complete closure at the right of the "undefended space." A small aneurism had formed behind the right aortic valve and ruptured into the right ventricle.

Tate describes a trumpet-shaped membranous tube extending from a rounded opening at the lower part of the anterior aortic valve into

[1] Progrès méd., 1885, 2 ser., vol. ii. p. 121.
[2] Med. Press and Circular, 1883, vol. xxxv. p. 354.
[3] Med. Record, 1883, vol. xxiv. p. 249.
[4] Transactions London Pathological Society, 1892, vol. xliii. p. 34. [5] Ibid., p. 36.
[6] Bull. de la Soc. Anatomie, 1836, p. 68. Quoted by Taruffi, Sulle malattie congenite e sulle anomalie del cuore. Bologna, 1875, note, p. 102; and by Vierordt, Nothnagel's specielle Pathologie u. Therapie, 1898, vol. xv. I. Theil, II. Abth., p. 79.

the right ventricle. At the same time there was a saccular projection in the right ventricle at the "undefended space."

Congenital communication between the pulmonary artery and the aorta are to be traced back to developmental anomalies of the septum that divides the primary arterial bulb into two large vessels. A defect of this sort dates from some period of intra-uterine life before the seventh or eighth week, because at this time the pulmonary artery and the aorta are completely separated (Born,[1] His[2]). Based upon the presence of fenestrations of the aortic valves in the case of aortic and pulmonary opening described by Cæsar, H. Vierordt[3] suggests that the septal defect may be the result of an extension to the arterial wall of the process of hollowing out, whereby the primary endothelial cushions are converted into thin leaflets. At all events, the uncomplicated nature of the defect in most of the cases, including the one now reported, indicates that the defect is the result of abnormal developmental processes rather than of inflammatory changes (endangeitis). Similarly, communication between the aorta and the right ventricle may be ascribed to faulty development of the aortic septum; complete union between the interventricular septum and the aortic septum may fail to take place during the time that the conus arteriosus takes up part of the auriculo-ventricular orifice (about the seventh week—Born).

The clinical features of direct congenital communication between the pulmonary artery and the aorta are considered by L. Brocq,[4] H. Vierordt,[5] and Leon Cazin.[6] The latter author made the clinical diagnosis of this lesion in a young woman, but in the absence of post-mortem examination its correctness will always be open to doubt. L. Brocq[7] shows that the location and the mechanical consequences of congenital aortico-pulmonary communications are the same as in accidental communications; but in the first the lesions are more pure, hence the true symptomatology should be sought in the congenital form; but the number of instances of the latter is as yet rather small for drawing a definite clinical picture. In most of the recorded cases the lesion was a surprise revealed by the autopsy.

The cases are equally distributed between the sexes. The age attained varies from a few hours to thirty-seven years.

In all the cases that died at an age of from four to thirty-seven years

[1] Beiträge zur Entwickelungsgeschichte des Säugethierherzens, Arch. f. mikr. Anat., 1889, vol. xxxiii. pp. 284–378.

[2] Anatomie menschlicher Embryonen, Leipzig, 1880, vol. iii. p. 140. Beiträge zur Anatomie des mensch. Herzens, Leipzig, 1886. See also Minot, Human Embryology, 1897, pp. 521–534.

[3] Nothnagel's specielle Therapie u. Pathologie, vol. xv. I. Theil, II. Abtheil., Die angeborenen Herzkrankheiten, 1898, pp. 138–141.

[4] Loc cit.

[5] Loc. cit.

[6] Communication cong. entre l'aorta et l'artère pulmonaire sans persistance du canal artérial. Thèse de Paris, 1897.

[7] Loc. cit.

definite symptoms of heart disease were present; in three of them the heart lesion seems to have been the cause of death (Fräntzel, Baginsky, Richards); in two the cardiac disease was complicated by meningeal and urogenital tuberculosis (Cæsar, Girard). In the case now reported there was a general and marked infection with B. mucosus capsulatus.

By reference to the table of cases it is seen that the statements with respect to cardiac murmurs vary much. The most common murmur is a double one—systolic and diastolic—at the base; in Girard's case there was also persistence and accentuation of the second sound. In several cases the changing, uncertain character of the murmur is noted.

Occasionally hypertrophy of the heart, especially at the right ventricle, quite commonly noted at the autopsies, was demonstrated by the physical examination. In all cases where the condition of the ventricle was noted there was found more or less hypertrophy, sometimes only of the right ventricle, but occasionally of both, the right being the larger; the reason for this being that the right ventricle contracts against the current sent out by the left side of the heart, which is the naturally stronger side.

Dyspnœa, cyanosis, ascites, and anasarca were present in Fräntzel's case, and in Baginsky's, Girard's, Richards', and Wilks' cases some one of these evidences of grave disturbance of the compensation are noted, cyanosis being definitely mentioned by Cæsar and Girard, as well as Fräntzel; but the statements in regard to cyanosis are hardly definite enough to determine whether it was due to the defect itself or to the resulting cardiac insufficiency. In the infant that I examined cyanosis was fairly well marked. In this case there was also complete anuria.[1]

II. *Regurgitation through smooth depression under base of anterior aortic valve, which is attached to and carried across by a tendinous bridge; hypertrophy of the heart; dilated arterial duct; congestion. Post-mortem* (838).—A well-developed, well-nourished female, new-born child; the body still warm; the umbilical cord is dry and there is a line of separation around its insertion at the navel; rigor is strong; the surface of the body is livid.

The serous cavities of the trunk are empty; their linings smooth. The diaphragm reaches to the fifth ribs.

The pharynx, larynx, and trachea are normal. The thymus and thyroid are normal. The lungs are distended and contain many areas of hemorrhage, subpleural and deep-seated. The lungs crepitate freely; no bronchitis; much congestion.

There are subepicardial extravasations at the base of the heart. The heart is distended with blood. There is great enlargement of the heart, especially the left ventricle. From base to apex the heart is 4.5 cm. long and 5 cm. across the widest base. The heart weighs 42 grammes. The endocardium of the right side is normal. The depth is 4 cm.;

[1] See Cotton.

the wall is 3 mm. thick. The tricuspid orifice is 1 cm. in diameter. The foramen ovale is patent, and the ductus arteriosus is large and widely open, the aortic orifice of the duct measuring 6 mm. across; it

FIG. 2.

Bulging at aortico-septal junction and communication between aorta and left ventricle under anterior aortic leaflet

FIG 3

Amplified sketch of malformation seen in Fig. 2.

is normally located. The pulmonary artery is normal. The mitral orifice is small—about 0.5 cm. in diameter; the auricular surface of the valve is smooth, but somewhat nodular, and there are also slight

thickenings upon the chordæ tendinæ; no ulceration; no thrombosis. The aortic valves are large, higher than normal (about 6 mm.), of irregular thickness, but smooth, there being small, delicate, reddish nodules upon them, so that they appear somewhat deformed.[1] There are no distinct lunulæ or corpora arantii. There are three valves, but the anterior segment is attached to an irregular, dense, and firm, band-like bridge, 2 mm. thick, which extends across an oval depression in the upper part of the interventricular septum and the lower aspect of the aorta, which here presents a marked bulging anteriorly between the aorta and pulmonary artery (Figs. 2 and 3). It looks as if the lower end of the aorta and the interventricular septum had failed to develop fully. The junction of the septum and of the aorta occurs under the bridge, the line of exact junction being rather indefinite. The depression is 1.5 cm. vertically, 1 cm. across, and 8 mm. deep. The bulging is smooth, and there is no communication between it and the pulmonary artery or the left ventricle. The left half of the upper limit of the depression is marked by a rather sharp ridge in the aorta, but the right half is marked by a rounded bulging. Viewed from the right ventricle the "undefended space" appears as a triangular area near the centre of the depression in the aorta. The interventricular septum is not perforated. The left ventricle is 4 cm. deep, and the wall is 5 mm. in average thickness. The beginning of the aorta, just above the sinuses of Valsalva, is wider than usual, but smooth; it is 2.5 cm. in circumference.

The right coronary arises in the deep sinus behind the anterior semilunar valve, near the right end of the bridge. Its distribution is normal; some of the branches at its beginning are rather large.

The left coronary arises in the sinus of the left posterior semilunar valve; the opening is a little higher than the right. The upper margin of the sinus is outlined by a rather sharp ridge.

The liver is large, congested, bluish in color, and it weighs 127 grammes; it is smooth.

The spleen is congested and weighs 7 grammes.

The kidneys show marked uric-acid infarction in the medullary pyramids. The ureters and bladder are normal. The adrenals are normal.

The stomach and intestines are normal.

The brain could not be examined.

Bacteriological Examination. Smears and cultures from the heart's blood and from the large organs do not contain any bacteria.

Histological Examination. The alveoli in some parts of the lungs are filled with blood; also the bronchi; the lining epithelium normal. Spleen, adrenals, kidneys, thyroid, and liver greatly congested; most of the alveoli of the thyroid are empty; in some is a pinkish material (hæmatoxylin and eosin stain). Sections of the mitral valve show no inflammatory changes.

Study of the anomalies of the semilunar valves quickly brings out the unique and peculiar character of the anomaly in this case. Indeed, it is not an anomaly of the aortic valves as much as of the aortic sep-

[1] At the autopsy the irregularities were thought to be due to endocarditis, and it was so stated in the anatomical diagnosis.

tum. I have found no mention of any similar condition in the literature.[1]

The most common anomalies of the semilunar valves are the well-known fenestrations near the free margins, and deviations in number,[2] size, and form. Other congenital anomalies are very rare, indeed. Dilg[3] describes a rare and complicated anomaly: right conus stenosis, two pulmonary semilunars, and stenosis of the conus of the left ventricle produced by a peculiar circular endocardial fold partially subdivided into valves, the shallow, valvular sinuses opening toward the ventricle. Dilg regarded this tendinous ring as an imperfect, second row of valves, the condition resembling somewhat that observed in some of the bony fishes in which the conus arteriosus presents several transverse rows of valves.[4]

In Banks'[5] case of "perforation of the aortic valves—loud musical murmurs"—the aortic valves were "cribriform," and there were three little rudimentary valves one-quarter of an inch below the aortic orifice. Corrigan,[6] in a letter to Banks, attributes the musical murmur to the vibrations of the rudimentary valves.

Röhrle[7] describes a tendinous cord in the aorta of a child. This was the only case of the kind in 25,000 autopsies at the Foundlings' Home in Moscow. The tendinous band originated at the left end of the left semilunar valve, and was stretched quite tightly across part of the lumen of the aorta to the left end of the right semilunar valve. The two ends were thin-like threads; the central part was 0.5 mm. in diameter.

Robert S. Archer[8] describes a similar band in a man, aged thirty-nine years. The band was stretched loosely across the lumen of the aorta just above the line of insertion of the aortic valves. It arose by an expansion, one-half inch wide, from the aorta just above the junction of the posterior and left lateral semilunar valves; gradually narrowing, it became inserted at the junction of the posterior and right lateral cusps, thus dividing the area of the vessel into two unequal parts. It seemed to consist of the same kind of tissue as the valves. Otherwise the heart was normal. No clinical observations of the heart's

[1] Potain and Rendu (anomalies de l'orifice aortique, article cœur, Dictionnaire encyclopedique des sciences médicales, 1876, vol. xviii. p. 571); Marchand (Eulenberg's Realencyclopædie, 1897); Peacock (Malformations of Human Heart, 1866); Taruffi (Sulle malattie congenite e sulle anomalie del cuore, 1875), and H. Vierordt (Nothnagel's Path. u. Ther., 1898, vol. xv.) do not mention any anomaly resembling this.

[2] Peacock, loc. cit. Osler, Bicuspid condition of aortic valves, Transactions Association of American Physicians, 1886, vol. i. p. 185.

[3] Virch. Arch., 1883, vol. xci. p. 193.

[4] Gegenbauer. Lehrb. der Anat. des Menschens, Leipzig, 1883, p. 625.

[5] Dublin Hospital Gazette, 1857, vol. iv. [6] Ibid., p. 49.

[7] Chorda tendinæ in aorta, Deut. med. Wochenschr., 1896, p. 270.

[8] Notes on a congenital band stretching across origin of aorta. Dublin Journ. of Med. Sci., 1878, vol. lxv. p. 405.

sounds were made. Archer believes the development of this band in some way was connected with the development of the valves.

Kretz describes an analogous case in which two fibrous bands crossed the aorta from before backward; one, arising from the right aortic valve, was inserted into the concave side of the aortic arch, 3 cm. above the valves; the other crossed the aorta higher up. These bands are regarded as remnants of the partition between the two embryonic aortæ.

Bouillaud[1] also describes an aortic band or fold, but I have not been able to secure the details. Stintzing[2] describes a replacement of one pulmonary segment by two parallel, wholly attached, smooth, narrow bands or ledges extending, one wholly, the other but half-way, across the valveless space. Duckworth[3] showed a heart with four semilunar valves. "The adventitious valve . . . communicated with one of its fellows at its insertion by an aperture large enough to admit a crow-quill."

There is nothing directly comparable with the anomaly in the present case.

The marked leakage under the base of the anterior valve produced hypertrophy of the heart, especially the left side; it also led to marked dilatation of the arterial duct, and, further, to pulmonary and general venous congestion.

The smoothness of the depression at the aortico-septal junction, the normal condition of the coronary artery arising from its bottom, and the well-formed aortic valves tend to the conclusion that the lesion is the result of purely developmental disturbances rather than of intra-uterine aortitis; but the exact genesis of the anomaly is probably not explainable at this late day. One may say, however, that "as with every other anomaly, adequate knowledge will show it to be a natural sequence."

The exact developmental history of the human semilunar valves has not been worked out. According to current teaching,[4] four small endothelial cushions appear at the ventricular orifice of the bulbus aortæ before its division in the aorta and pulmonary artery has taken place. Two of these are merely the ends of the ridges by which the aorta is divided (Minot). On completion of the division the two ridges are divided, thus making four protuberances, or in all six—three for each

[1] Bull. de l'Acad. de Méd., 1862-63, vol. xxviii. p. 777.

[2] Ueber eine seltene Anomalie de Pulmonalklappen. Deut. Arch. f. klin. Med., 1889, vol. xliv. p. 149.

[3] Trans. London Path. Soc., 1886, vol. xvii. p. 113.

[4] Born, Arch. f. mikr. Anat., 1889, vol. xxxiii. pp. 284–287. His, Beiträge zur Entwickelungsgeschichte des Saugethierherzens. Tonge, Observations on the development of the semilunar valves of the aorta and pulmonary artery of the heart of the chick. Proc. of Royal Soc. of London, 1868, vol. xvi. p. 335. Minot, Human Embryology, 1892, p. 534.

artery. These cushions may be seen in the human embryo of seven weeks (Minot). From them develop, by a process of hollowing out, the semilunar valves.

As already apparent, there is no malformation of the valves proper in this case. The endothelial cushions appear to have developed normally. Possibly the hollowing-out process may have extended to the wall of the aorta, and thus produced the oval depression under the valve, in the same way as Vierordt suggests that communication may be produced between the aorta and the pulmonary artery (page 169). It is a little difficult to understand, if this explanation be accepted, how the hollowing-out process could have jumped, as it were, so completely from the valve and out upon the aorta.

We learn further from embryology that the two ridges that divide the primitive aorta extend into the ventricle and help to form the interventricular septum. The aortic septum grows down to the edge of the septum inferius of the ventricle, and thus turns the original interventricular opening into the orifice of the aorta. This is accomplished chiefly by the left or anterior ridge, the right or posterior passing out on the lateral wall of the ventricle, where it is lost. The left ridge, however, runs on to the edge of the septum inferius (Minot). The thinness and the bulging of the aortico-septal junction under the anterior valve may be regarded as indicating a defective development of this part of the aortic septum—the left or anterior ridge. Union with the septum inferius ultimately took place; perhaps the septum inferius extended further up than usual; but in the meantime the endothelial cushion forming the anterior valve had extended across the defect. The primary endothelial cushions normally grow out until they meet each other. If there were an opening into the right ventricle at the bottom of the present aortico-septal depression no one would hesitate a moment in interpreting the anomaly as the result of a defective aortic septum. No doubt the depression in this case has greatly enlarged, until somewhat resembling an aneurism, by the pressure of the direct and regurgitating blood-streams that passed under the valve. Looking at the case in this way, one may say that defective aortic septum may lead to communication between the aorta and the pulmonary artery, between the aorta and the right ventricle, and between the aorta and the left ventricle under a semilunar valve.

REPORT OF A CASE OF BLASTOMYCETIC DERMATITIS.[1]

By Henry W. Stelwagon, M.D., Ph.D.,
of Philadelphia.

The case to which I desire to call the attention of the members of this Congress is one which bears close resemblance clinically to other reported cases of this disease, several of which will doubtless be referred to in the papers on this same subject to be presented by my colleagues, Dr. James Nevins Hyde and Dr. T. Casper Gilchrist. This case has interested me much, and when it first came under observation I had no hesitation in expressing the opinion that it was a well-marked example of verruciform tuberculosis of the skin, of somewhat extensive development. Photographs of the cases of blastomycetic dermatitis already reported by the gentlemen just named coming under my notice induced me to believe the case to be one of this rare disease. Histological and bacteriological examinations, and the behavior and progress of the disease, have confirmed this revised opinion.

It is not, however, my purpose at the present time to go into a discussion of the disease, but merely to present the data of this case, and thus add to the as yet scanty literature of the subject one more case to those already reported. The reporting of cases of a rare disease is the essential foundation upon which its status and our future knowledge of its characters must be built. Briefly summarized, the case may be described as follows:

The patient, a male, aged forty-nine years, of English birth, but living in the United States for the past thirty years, came under my care in the Hospital Dispensary of the Jefferson Medical College of Philadelphia, in April, 1899. His occupation up to five years previously had been that of a hostler, but since then he had been variously occupied in work of light character. His family history is most excellent. He has two sisters and two brothers living, all over the age of forty years, and all healthy. He has two sisters and two brothers dead: one sister died when six months old, of cause unknown to the patient; the other sister died from an abdominal operation when aged sixteen years; one brother died of scarlet fever and the other was killed in an accident. His father died at the age of forty-seven years, the exact cause of death not being known; his mother is living, at the age of seventy-five years. Both on his mother's and father's side the family record as regards freedom from disease and moderate longevity is unexceptionable. He has no knowledge of a single case of tuberculosis in his family, near or remote. He has not, moreover, so far as he knows, ever been brought into contact with any consumptive person. His own general health has always been good. With the exception of the usual

[1] Read before the International Congress of Dermatology and Syphilography, held at Paris, August 2-9, 1900.

children's diseases, and a pneumonia in 1872, from which he made a good recovery, he has had no illness. He has never had venereal disease of any kind, nor has he had any skin eruption until the present disease manifested itself. He is of dark complexion, eyes and hair black, and is of moderate build and in a fair condition of general health, considering that he is poor and to a great extent debarred from making an ample living. He has two children approaching maturity, both in good health; his wife has never had any miscarriages.

The cutaneous disease began on the back of the right hand, just over the bases of the metacarpal bones of the first and second fingers. At this point the skin had been, about six weeks before the present condition began, slightly abraded or scratched by the teeth of a cat. These abrasions amounted to nothing more than superficial scratches, and in the course of ten days or two weeks healed completely. A few weeks later, on or about this same region, the first evidence of the cutaneous disease presented itself. Another fact, which although probably not having any relationship or bearing upon the disease, should be mentioned, and that is, at this time the patient was the possessor of a dog with the "mange," and having here and there loss of hair, which he was in the habit of constantly fondling.

The disease began, as well as the patient can describe, as a small, flat pustule or boil; this was accidentally broken open by a knock. It subsequently healed, and had in a month or six weeks practically disappeared excepting a slight, flat elevation and thickening. Soon afterward it began to swell and to fill up again, and tended to spread out laterally, with a slight surrounding inflammatory border and infiltration. In addition to a central opening the lesion broke down at two or three other points peripherally, which discharged, occasionally spontaneously or upon pressure; subsequently blackish crusts formed over these openings, so that the surface of the disease, which now involved an area of about one and a half inches in diameter, was covered here and there with these small, blackish crusts; from beneath one or more at times would exude seropurulent or serous liquid. It again began to spread, and in the course of months involved almost the entire dorsum of this hand. A new feature soon presented itself: early in 1898 a sluggish, shallow abscess-formation began to present itself on the upper arm close to the shoulder, which at first broke at the central point; filled up again and broke, and later also broke down at two points toward its periphery; the liquid discharged was of a seropurulent character, as a rule, but occasionally the exudation would be purely serous. The disease on the hand also took on more rapid action, spreading by lateral extension, extending up to the wrist and verging close on to the fingers. New sluggish, cutaneous swellings also presented upon other parts of the arm and forearm, and in this manner the disease gradually progressed There had never been much pain.

The condition of the patient when he first came under my care was as follows: The disease involved the whole dorsal aspect of the hand and lower wrist, with slight extension on to the fingers, as shown in Photograph No. 1. The surface was elevated and distinctly papillomatous, and discharged, especially upon slight pressure, a seropurulent liquid from some points and from others a liquid of a clear, somewhat thick, gummy character. The elevation was considerable (one-fourth to one-half inch), and at the borders there was a rim of slight infiltration,

gradually falling off and merging into the surrounding healthy tissue. In a few places there was a thin, ill-formed, cicatricial surface. Upon pressure the serous and seropurulent, sometimes slightly sanious, liquid could be pressed out from between the papillary projections. At this time he had several of the old subcutaneous, abscess-like formations upon both forearm and arm; one had entirely disappeared, leaving a thin, somewhat striated scar; another had practically disappeared, leaving slight thickening, with purplish-brown pigmentation.

These formations, which were of a violaceous or purplish color, would begin, as a rule, about alike: some slight superficial lumpiness, followed by a variable central upheaval, which subsequently broke centrally, and later, as a rule, at one or more other points peripherally. In one or two of these formations the single central opening alone presented, the lesion filling up several times. On the other hand, in others of these

Photograph No. 1. Blastomycetic dermatitis. Taken April, 1899.

abscess-like lesions there were a number of openings scattered over its surface, especially well marked in the one on the middle of the forearm; it was distinctly cribriform, bearing resemblance to both a small, flat carbuncle and also to kerion, more especially to the latter. There was never any of the active inflammatory border and base usually seen in carbuncles, but, on the contrary, the inflammation was of a comparatively sluggish character, such as observed about suppurating lymphatic glands of the neck. Such formations when fully completed were usually of about one to two and a half inches in diameter, elevated from the edges toward the centre, with usually an insignificant infiltrated border, and of violaceous or purplish color. The contents consisted of sero-pus and serum, which would come out spontaneously or which could readily be pressed out. The small openings would subsequently crust over with brownish or blackish crusts, and the formation slowly

begin to fill again and again discharge. At times what appeared to be pure serum would ooze out from one or more of these openings. These sluggish, flat, abscess-like formations would last almost indefinitely, in fact displaying very little tendency to disappearance. Sometimes the formation would discharge actively at first, and then almost entirely disappear, subsequently resuming a semi-sluggish activity. There was, however, in most of these formations a tendency to gradual healing, but it was slow and irregular, with exacerbations of active re-formation.

During the past several months a number of such new formations appeared, especially about the forearm and wrist. Occasionally there would be a tendency to accumulation of the contained liquid at two or three places on the dorsal surface of the diseased hand, producing slight swellings, followed by discharge. As a rule, however, the hand had

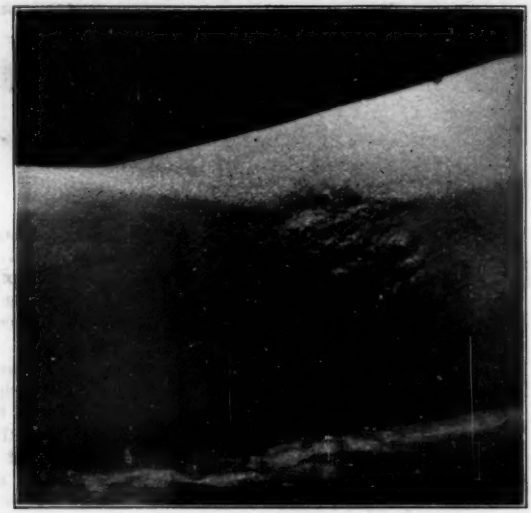
Photograph No. 2. Blastomycetic dermatitis. Taken March, 1900.

presented continuously its verrucous or papillomatous character, the secretion not collecting in abscess formation, but oozing out from the interpapillomatous crevices almost continuously. This papillomatous tendency was not displayed to any marked extent with the boil-like formations on the forearm and arm, although it was occasionally observed in some parts of the earlier lesions.

The back of the hand, in the region of the beginning disease, showed some slight improvement, so that the patient at the end of eight to ten months after coming under observation had, upon the whole, improved, as shown in Photograph No. 2, taken in March, 1900, although the improvement was not marked. As this photograph shows at this time, the hand presented less active disease; but nevertheless it also shows that the disease had extended slightly up the wrist and also further on to the fingers. At this date (April 23, 1900) smears and inoculations were made from the liquid of the boil-like formation on the arm and from

that which exuded from between the papillomatous projections of the dorsal surface of the hand. The patient would not permit excision of the tissues at this period. The report of this examination will be referred to below. The patient now disappeared. The last of June he

Photograph No. 3. Blastomycetic dermatitis. Taken June, 1900.



Photograph No. 4. Blastomycetic dermatitis—kerion-like lesion on arm. Taken June, 1900.

again presented himself. There was distinct improvement of the hand (Photograph No. 3) and also of the older formations on the arm and forearm. Places on the back of the hand had healed over, and were covered with thin scar or imperfectly formed epidermic tissue. The papillomatous appearance was, however, still maintained in the unhealed portions, although probably not to such a pronounced degree as formerly. The sluggish lesions on the arms were still there, and had increased in number, one or two new lesions having presented. The kerion-like or carbuncular-looking lesion, with its cribriform surface, situated about the middle of the forearm, was still actively discharging if but slightly pressed upon. This formation is shown in Photograph No. 4, taken the last of June, 1900.

At this time a survey of the disease showed the condition to be as follows: There was a flat, walnut-sized discharging boil-like tumor on the under part of the upper arm, near the axilla; one somewhat smaller over the biceps muscle close to the upper end, which, however, was about healed; below this was a slight, striated scar, the site of the first formation already referred to; on the extensor surface of the arm near the elbow there were two of these formations, healed over, but still somewhat elevated; on the outer side of the forearm, just below the elbow, there was a formation of a similar character to the last named; on the flexor surface of the forearm there was another of these formations, about one and a half to two inches in diameter, with the cribriform discharging openings, sometimes crusted over, above described; on the dorsal surface of the forearm there was near the wrist a similar growth, and two small, insignificant formations on the flexor side of the wrist. On the dorsal surface of the hand there were several small, boil-like formations with orifices closed over with crusts. At this time more material was obtained for histological and bacteriological examinations. The patient also permitted a few small pieces to be excised. The liquid was taken from the arm lesion and from between the papillomatous projection of the dorsum of the hand. The examinations of the material obtained at the two different periods mentioned were made by Dr. Randle G. Rosenberger, of the Jefferson Medical College Laboratory. The findings are essentially the same, and, therefore, only the investigation made last is given.

Dr. Rosenberger reports as follows:

Specimens consist of (1) spreads, (2) fluid from the lesions, and (3) several small masses excised from the lesions.

1. The spreads were stained with gentian-violet by Gram's method, methylene-blue, and for tubercle bacilli. Those spreads stained with gentian-violet, methylene-blue, and by Gram's method, show histologically numerous polymorphonuclear and a few mononuclear leucocytes, and a few squamous epithelial cells, also a few shreds of fibrin. Bacteriologically the spreads show numerous micrococci arranged principally in pairs, some in short chains of ten or twelve elements (streptococci), and others in irregular bunches (staphylococci). The diplococci are for the most part extracellular, a few being intracellular. Together with these organisms there are spherical and slightly oval bodies, a few possessing small projections which correspond to buds. These bodies are undoubtedly yeast fungi. A few bacilli, 2μ to 3μ in length and 0.5μ in thickness, resembling slightly the tubercle bacillus, were also

seen. Upon staining especially for tubercle bacilli, however, none were demonstrable.

2. The fluid, of which there were only a few drops, was light yellow in color, clear, and without sediment. Examined in the fresh condition a few leucocytes, principally polymorphonuclear, were demonstrable. Numerous micrococci and streptococci were also to be seen. Inoculations made from this fluid on agar show a culture consisting of small, opaque, whitish colonies, remaining discrete. Spreads made from these colonies and stained by ordinary methods show a pure culture of staphylococcus pyogenes albus.

3. Three small masses or shreds of tissue were received in 40 per cent. alcohol and one mass received in fresh condition. Those from the alcohol were thoroughly dehydrated and embedded in paraffin. Sections were cut and stained with hæmatoxylin and eosin, gentian violet, and by Gram's method, and also for tubercle bacilli. Sections stained with hæmatoxylin and eosin show the mass to consist of stratified, squamous epithelial cells, with a large quantity of granular débris. Sections stained with a gentian-violet and by Gram's method show numerous micrococci and a number of the spherical cells similar to those found in the spreads, a few with buds and one showing distinctly a double-contoured outline. They are arranged for the most part in groups and are situated deep down in the tissues. In sections stained for tubercle bacilli none were demonstrable, but with the counterstain used the spherical cells were again to be seen.

The small mass of fresh tissue was placed in a glycerin-agar tube, and up to forty-eight hours no growth was demonstrable. It was then removed, macerated in sterile bouillon, and again inoculated on glycerin-agar; spreads were then made from the macerated tissue and stained with gentian-violet. These spreads showed numerous polymorphous leucocytes, few squamous epithelial cells, and numerous spherical cells, some with distinct buds and one or two with double-contoured outline. They stain homogeneously throughout.

In the judgment of Dr. Rosenberger, and in accordance with my own belief, the fungous cells found are substantially similar to those found in this disease by other observers, although they are for the most part somewhat smaller. An interesting point which I wish to emphasize is, that, although careful examinations were made in both investigations for the tubercle bacillus, the results were uniformly negative. The clinical resemblance to tuberculosis verrucosa cutis is, indeed, striking; but upon careful consideration and observation it seems to me that the course and characters of the blastomycetic disease differ, to some extent, from those of tuberculosis; the repeated kerion-like or subcutaneous abscess formation with, in some such lesions, the cribriform surface, and the character of the contents and of the discharges from the papillomatous interstices are somewhat unlike those of tuberculosis of the skin. Still, it must be admitted that a positive and unquestioned diagnosis in these cases between blastomycetic dermatitis and certain forms of cutaneous tuberculosis can scarcely be made without histological and bacteriological investigations.

There is also a resemblance to the papillomatous tubercular syphiloderm, but to a less degree than to cutaneous tuberculosis. The fact that in a few of the reported cases marked improvement from iodide administration ensued has suggested the suspicion that these cases represent an aberrant type of cutaneous syphilis. While it is true that improvement and cure of an unusual and persistent cutaneous manifestation by the iodides must be given weight, and ordinarily point to a diagnosis of syphilis, there are exceptions to this. For example, it is now known that in some cases of undoubted actinomycosis, a disease in many respects similar to blastomycetic dermatitis, the administration of the iodides has been followed by cure. In syphilis the discharge from the interpapillomatous spaces and from the gummatous lesions is usually markedly purulent, and rarely, if ever, purely serous or mucoserous, as in blastomycetic dermatitis. In this latter disease, and strikingly so in my case, the serous and mucoserous characters of these fluids was noticeable throughout; and these discharges were never purely purulent, only showing here and there or now and then a slight admixture of pus. Moreover, the general clinical characters were scarcely suggestive of syphilis.

In the treatment of this case not much is to be said. The man has been irregular in his attendance at the hospital, and has not had the continuous care desirable in such cases. Nevertheless, there has, on the whole, been improvement, though very slight, under simple, mild antiseptic applications and tonic remedies internally. Small doses of potassium iodide were given in the beginning of the management of the case, but as no improvement was then noted, and the digestion being thereby disturbed, this remedy was discontinued. At each time that the patient visited the hospital, which he did for short periods daily and at other times at intervals of a week or so, the abscess-like formations were opened and the contents pressed out, and all the affected parts were cleansed and sprayed with dilute hydrogen peroxide; an ointment of boric acid and ichthyol was then applied. During the absence from the dispensary the patient continued to apply this ointment, spread as a plaster, renewing daily, and before re-application cleansing the parts with boric-acid solution.[1]

[1] This paper is based upon observations of the case ending in June. The patient came again under continuous observation and treatment in September, two months later. The same conditions prevailed, although there had been some slight change for the better. The iodide was again administered, but instead of potassium iodide as formerly, the sodium iodide was prescribed, and the dose gradually increased to thirty grains three times daily, along with the same applications locally as before. Since then slow and steady improvement has ensued, sufficiently pronounced after two months' observation and treatment to point with considerable probability toward eventual control of the disease.

REFRACTORY SYPHILIS, WITH REPORT OF A CASE UTTERLY RESISTANT TO SPECIFIC TREATMENT.

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There are few diseases in which the physician has at his command such a sure and powerful remedy as mercury in syphilis. The introduction of the iodides in the treatment of this affection by Wallace, of Dublin, completed the therapeutic armament necessary to combat successfully this wide-spread and formidable disease. The treatment of syphilis with these two drugs has, within the past fifty years, been so uniformly successful that the dreaded scourge of the last century has come to be regarded as one of the diseases yielding the most gratifying therapeutic results. So far has this confidence extended that the failure of lesions to respond to the influence of mercury and the iodides suffices to cast a doubt upon their syphilitic nature. The therapeutic test has come to be universally regarded as a valuable diagnostic aid.

In the vast majority of cases mercury and its adjunct, iodine, accomplish all that could possibly be desired. In exceptional instances, however, they fail, and the knowledge of this fact is of importance, for it places certain limitations upon the value of the therapeutic test. This has prompted me to report the following case:

Mrs. X., aged thirty-nine years, was married seventeen years ago. Has four children, aged respectively sixteen, fifteen, twelve, and eleven years, all of whom are well. Had two miscarriages ten and thirteen years ago. Her family history is good, both parents being alive and well at the age of seventy years.

In 1892, eight years ago, the husband manifested evidences of syphilis, and soon thereafter his wife, the present patient, contracted the disease. The history given by the patient of the symptoms during this period is rather vague. In 1896 she suffered from ulcerative lesions upon the arms, legs, cheeks, and nose, and "sores" in the mouth. A patch upon the foot at this time persisted an entire year despite vigorous treatment. Since 1892 the patient has never been free from outbreaks of one character or another. The manifestations of the disease have not only been extremely obstinate, but their disappearance has been invariably followed by a renewed outbreak in the same region or elsewhere.

Present Condition. The patient is a stout, apparently robust woman. Her present weight is 180 pounds. Upon the right cheek is an annular scar, the remains of a former lesion. Upon the back of the neck, arms, hands, and thighs are visible a number of irregular whitish areas exhibiting loss of pigment. This leucoderma began, according to the patient's statement, about one and one-half years ago.

Upon the extensor surface of the left elbow is a circinate, dollar-sized patch (Fig. 1) made up of pea-sized moderately infiltrated tubercles. The

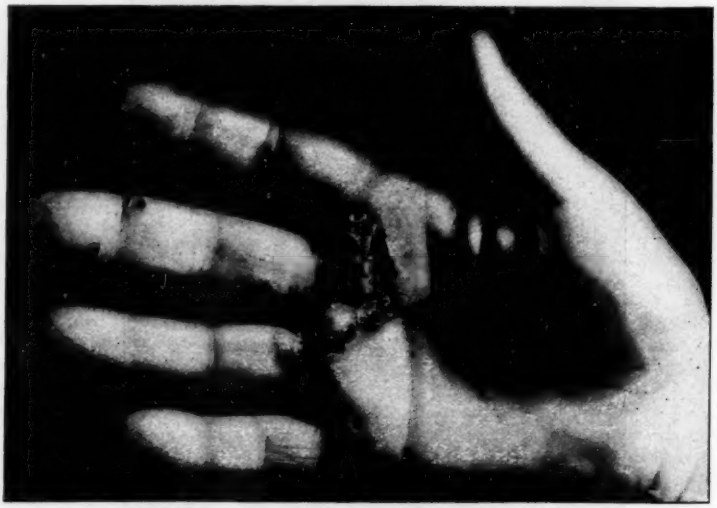
palmar surface of the right hand shows a papulo-squamous eruption extending in the form of the segment of a circle 6 mm. broad, from the base of the ring finger to the web of the index digit (Fig. 2). Here the eruption winds around the lateral surface of the fingers, ending upon the middle finger, the dorsum of which exhibits numerous flat and angry-looking tubercles. A few tuberculo-ulcerative lesions are present upon the palmar surface of the middle finger. There is suppuration beneath the nail of this finger which is the seat of a painful paronychia. While the patient is robust in appearance, her health is by no means good.

FIG. 1.

She suffers from time to time from nausea, diarrhœa, and cramps. She is frequently subject to headache, and complains constantly of weakness. Despite this, however, she has gained about twenty pounds in the past two years. The condition of the kidneys is normal. Since the beginning of her trouble the patient has been under more or less constant treatment. During the early years of the disease she was under the care of a physician who subjected her to a number of courses of hypodermatic mercurial injections. It appears that these did not suffice to keep the disease in check, for she had repeated syphilitic outbreaks. During the past year the patient has been treated at the Philadelphia

Polyclinic. During this period she has received sixteen injections of bichloride of mercury, as high as one-half grain to the dose, and has used one hundred and ten inunctions, each containing one drachm of the unguentum hydrargyrum. The iodides were not neglected, the patient having taken as much as sixty drops of a saturated solution of potassium iodide three times a day. In addition to this she has from time to time been placed upon the protiodide of mercury by mouth, combinations of potassium iodide, and the biniodide of mercury, Zittmann's decoction, tonics, and reconstructives. This treatment has failed to exert any pronounced influence either upon the disease or upon the existing syphilitic lesions. The papulo-squamous syphilide upon the hand and finger and the annular patch upon the elbow have on several occasions almost disappeared under the use of the inunctions

FIG. 2.



and injections of mercury, but just as we were about to credit the treatment with the favorable influence exerted the eruption would relapse. Owing to the immersion of the hand in water the eruption would at times take on an eczematous appearance. Local treatment has been used almost constantly, an ointment of calomel and carbolic acid having been found to give the best results.

There are many lesions of syphilis which for a time refuse to yield to anti-syphilitic treatment. This statement is particularly true of late palmar and lingual manifestations. These, however, will usually disappear under a sufficiently vigorous treatment. While such lesions might be termed obstinate, they would not belong to the class designated by Fournier as "refractory syphilis." In his incomparable work

on the treatment of syphilis, Fournier[1] says: "There are cases of syphilis against which all treatment is unavailing. In the absence of a better term (for the one which I employ satisfies me but incompletely) I would call such cases 'refractory syphilis.' There are cases of grave syphilis with particular malignity, which show themselves by grave manifestations and incessant recurrences, despite all that one can do. But the worst thing about these cases is that an outbreak is no sooner cured than a new one appears upon the scene, and this despite a most correct treatment. After this has been cured with difficulty there occurs a third, and so on during long years." Such a case is the following:

This woman contracted syphilis thirteen years ago, and has always been thoroughly treated. Several times we have administered to her such an energetic treatment as to determine a considerable mercurial irritation of the mouth. Despite all our efforts, she has not ceased for thirteen years to be the prey of multiple attacks of severe tertiary accidents. Quite recently she returned to our wards for the ninth time with a frightful syphilide of the face. Analogous cases would be quite easy to cite.

In July, 1899, Fournier exhibited before the Société Française de la Dermatologie et de Syphiligraphie two cases of syphilis refractory to specific treatment. His report in brief is as follows:

Case I.—The patient is a woman who has had syphilis for two and one-half years. During this time she has not ceased to have multiple attacks of a malignant syphilis. At first profuse syphilides upon the skin and mucous membranes, headache, adenopathy, febrile attacks, loss of weight, anæmia. Then, after a few months, invasion of secondo-tertiaries, afterward frankly tertiary, tubercular and ulcerative lesions affecting the face and scalp, only disappearing under treatment to quickly reappear. Then deterioration of health, nervous phenomena, febrile attacks, and imminent cachexia. The patient has taken protiodide pills, Dupuytren pills, the syrup of Gibert, inunctions, potassium iodide (four to eight grammes a day), hundreds of injections of sublimate, benzoate of mercury, gray oil, and calomel to the number of forty. In addition, iron, quinine, glycero-phosphates, injections of serum, cold douches, etc.

The malignity of this case was attributed by Fournier to hereditary taint, the mother having been tuberculous, and the father, who was habituated to absinthe, had died of cerebral disease.

Case II.—The patient was for five years subject to attacks of malignant syphilis, particularly tuberculo-ulcerative with phagadenic tendency. This patient received one hundred and eighty injections of benzoate of mercury and one hundred and twenty injections of calomel without arresting but for short periods the syphilitic outbreaks.

[1] Traitement de la Syphilis, page 548.

In the patient whose history I narrate above no hereditary taint can be invoked, as both parents of the patient are living and well at the ripe old age of threescore years and ten. The patient is not in good health, but is by no means cachectic. Her 180 pounds of weight and her ruddy color disprove such a supposition. I am at a complete loss to explain the utter refractoriness of the disease to treatment.

PHYSIOLOGICAL DILATATION AND THE MITRAL SPHINCTER AS FACTORS IN FUNCTIONAL AND ORGANIC DISTURBANCES OF THE HEART.[1]

By Morton Prince, M.D.,
of boston.

In 1889 the reader[2] reported a series of observations of the hearts of men examined under nervous excitement. The conclusions arrived at were that under such conditions the mitral sphincter may be dilated by internal pressure, and the valve thereby may cease to be efficient, and regurgitation may occur into the auricle. It was further contended that as a pure physiological disarrangement the mitral valve may become functionally inefficient from causes that weaken the sphincter-like action of the circular fibres of the heart, and that this was the true explanation of many functional murmurs, so-called, as well as what is known as "relative mitral incompetency."

I now return to the subject. The muscular fibres of the walls of the heart are arranged in three layers. The external and internal layers run longitudinally, while those of the middle layer run around the heart as circular fibres, and are the principal propulsive power of the heart. A special layer of these circular fibres surround the left auriculo-ventricular opening as a sort of sphincter (Henle, Landois). For the sake of descriptive convenience these may be called the mitral sphincter, although they are only a part of the great cone of circular fibres which squeezes the blood out of the ventricle. A knowledge of this anatomical arrangement is important.

It should be understood that what is said here regarding the physiology of the mitral valve is true of the tricuspid, but for the sake of convenience I confine myself to the mitral.

The mitral sphincter as a factor in the normal mechanism of closing the mitral valve is recognized by physiologists (among others, Tigerstedt, Curtis, Chauveau and Faivre, and Hesse), but not by all clini-

[1] Read by title before the Association of American Physicians, at Washington, D. C., at the fifteenth annual session, May, 1900.

[2] Medical Record, April, 1889.

cians. A fairly thorough search of the standard American and English text-books on general medicine and diseases of the heart discloses the fact that with a few noteworthy exceptions[1] medical writers do not seem to recognize this mechanism of the mitral valve or, if they do, the important rôle played by it, and the diversity of conditions in which it may be a factor.

Whether the sphincter action is supplementary only to the closure of the valves, or whether it is necessary for complete sealing of the opening under ordinary conditions is not clear; but that under extraordinary conditions a failure of this sphincter-like mechanism results in mitral and tricuspid incompetence is susceptible of experimental proof.

We have the following series of facts:

1. *Anatomico-physiological Facts.* The mitral orifice differs anatomically from the aortic orifice in not being like the latter, circumscribed by a rigid ring of fibrous tissue, and, therefore, of fixed calibre. The fibrous tissue of the mitral ring, as Sibson showed by dissection, is so thin opposite the central attachment that practically the orifice is only partially surrounded by it, and hence the orifice dilates and contracts with the dilatation and contraction of the ventricles, this being effected by the sphincter *What holds the opening against the internal pressure is not a rigid ring, but the tonus and spasm of the circular band of fibres.*

The researches, among others, of Chauveau and Faivre, and later of Hesse, have demonstrated that during systole the circumference of the base of the ventricle and of the auriculo-ventricular openings is contracted to a high degree. In other words, the auriculo-ventricular openings contract during systole and dilate during diastole. Hesse[2] actually succeeded in obtaining casts of the ventricular cavities in diastole and systole, and in obtaining hardened hearts in the same stages, and from these he made sections. Hesse's results are shown by these diagrams. The great difference in the dimensions of the auriculo-ventricular openings is noticeable, and it is also evident that with the expansion of the base during diastole these openings dilate, and with contraction of the base during systole they contract. As these findings are actual casts and sections of the ventricular cavities, it is difficult to see that they do not represent possible variations in the physiological size of the auriculo-ventricular openings. On the other hand, it is not safe to conclude that these findings represent the actual variation in normal diastole and systole during life, but only that they are the possible limits of

[1] Among these Sir Wm. Broadbent should be particularly mentioned.

[2] The method employed was the following: The ventricles of a dog's heart immediately after being excised were subjected to the pressure of a column of blood equivalent to 150 mm. Hg., and a plaster cast then taken. Then, the chambers being emptied, the heart was plunged into a saturated solution of bichromate of potash, whereby the muscles contracted without resistance. Thus two casts were obtained representing two conditions: the one representing the heart filled to nearly its full capacity, and the other extreme contraction.

physiological variations. It is true they portray extreme conditions probably beyond any ever observed in immediately successive periods of time in one and the same heart during life. But nevertheless they demonstrate, and this is the point, that the auriculo-ventricular opening has a varying calibre, that it is capable of being dilated to a large degree and of being contracted by the sphincter muscle to a comparatively small dimension, and that in systole it does contract.

It still remains an unsettled point whether, under *normal* conditions, the action of the mitral sphincter is only supplementary or whether it is necessary, but the following may be stated:

1. The elastic fibrous ring is variable in size under moderate pressure.

2. That without the sphincter action the internal pressure would force the valve, for there would be nothing to keep the orifice from dilating but this muscle, and, therefore, that the sphincter is essential for *maintaining* a sealed orifice, though perhaps not for the apposition of the valves under ordinary conditions.

3. Under ordinary conditions the tonus of the sphincter is sufficient to keep the orifice within such limits that the valves can close it (King, Chauveau and Faivre, Colin, Baumgarten, and others), and, therefore, that merely filling the ventricles with fluid brings the valve curtains into apposition.

4. When for any reason the tonus of the sphincter is diminished or its muscular strength impaired, it may physiologically dilate to so high a degree in diastole that closure cannot take place without the aid of its contraction, or the sphincter may not be able to hold against internal pressure.

5. That under similar conditions the *degree* of contraction of the muscular fibres may not be sufficient to enable the valves to seal the orifice hermetically.

6. It is probable, therefore, that under certain conditions the action of the sphincter is supplementary, and under other conditions it is necessary.

I. Experimental Conditions in which Physiological Dilatation and the Mitral Sphincter are Factors.

Very valuable information on the physiological working of the heart has been given us by the brilliant experimental researches of Roy and Adami,[1] which throw light on the part played by the auriculo-ventricular sphincter in health and disease. This work does not seem to have received the attention from clinicians that it has from physiologists or that which its practical importance demands. I shall, therefore, de-

[1] Remarks on Failure of the Heart from Overstrain, by Prof. Roy and J. G. Adami, British Medical Journal, December 15, 1888.

scribe it here in some detail. These experimenters undertook to determine the physiological and pathological effect upon the heart of varying increase of work done. The method adopted to increase the work done was to increase the "pressure against which the heart has to force out its contents by narrowing the aorta at one or another part of that vessel."

The volume of the heart and the contraction of the muscular fibres were measured by special instruments and shown by graphic tracings.

A few of the more striking facts obtained are thus given:

"We may say that as the outflow of blood from the heart is interfered with the maximum pressure within the ventricle increases, this increase in pressure having a limit. . . .

"Such narrowing of the aorta produces a very evident distention of both ventricles, which, nevertheless, go on contracting and expanding in what to the eye seems a perfectly normal manner. Examination of the large veins, however, shows that in them, with the great or extreme narrowing just referred to, there is a very visible wave proceeding from the heart with each ventricular systole; in other words, this narrowing of the aorta produces regurgitation through both mitral and tricuspid valves. The effect, then, of greatly increasing the resistance which the ventricles have to overcome in the evacuation of their contents, is to raise the intraventricular pressure during systole to a height varying with the individual heart under observation, and to cause great expansion of the chambers of the heart with regurgitation eventually through the auriculo-ventricular valves.

"The heart itself, however, is appreciably affected by such change in the blood-pressure. Its size at the end of systole is greater than with normal arterial pressure—that is, there is not so complete an expulsion of blood; while, at the same time, its expansion during diastole is also greater. . . . The result is, that when the arterial pressure rises the volume of blood in the heart, both at the end of systole and at the end of diastole, is increased. Analogous results are produced when the arterial pressure is raised by other methods. In other words, the effect of variations in the arterial pressure on the heart is that increased resistance produces diminution of the systolic contraction of the ventricles, and the quantity of the blood entering the heart in any given time remaining the same, this diminished contraction is, *cæteris paribus*, necessarily accompanied by increased expansion in diastole.

"We have seen that in the experiments first referred to the expansion of the heart so produced leads, if extreme, to functional incompetence of the auriculo-ventricular valves, an effect which is all the more readily produced the more fatigued the heart is.

"There is also the fact that increase in the work done, other things being equal, produces diminished completeness of contraction in systole, and, therefore, an increase in the residual blood in the ventricle. This *physiological dilatation* of the heart with increased work becomes, when excessive, the cause of failure of the organ from overwork, or overstrain, as it is generally called; in other words, in such cases the heart goes on contracting and sending out all the blood which reaches it (excepting, of course, the residual blood) until the moment when, either

from increase in the arterial pressure, or from weakness of the heart-muscle resulting from fatigue or from disease of its walls, *the muscles at the basis of the ventricles no longer in systole narrow the auriculo-ventricular orifices to a degree which permits of these orifices being closed by their valves, these not being capable of expanding to the same extent as the muscular substance of the heart.*"

It will be observed that Roy and Adami interpret the regurgitation as due alone to the physiological dilatation of the sphincter. But from their experiments it is not clear that the closure of the valves may not at the same time be further hindered by the dilatation of the ventricular wall, which, carrying the papillary muscles with it, pulls apart the valves. Probably both factors co-operate. Prof. William T. Porter informs me that he has observed in dogs this physiological dilatation of the heart when working against increased arterial pressure brought about by contracting the aorta.

Roy and Adami made a further very extended series of observations upon the effect upon the heart of both direct and reflex excitation of the vagus and augmentor nerves. The excitation of the vagus, they find, among other things, to produce substantially the same effect as when the arterial resistance is increased, namely, a physiological dilatation.

The consequence of this dilatation is that the amount of blood expelled at each beat may be doubled, trebled, or even quadrupled. The increase of the residual blood may be so great that, as can be seen from the cardiometric tracings, *the volume of the heart at the end of systole may be greater than was the volume of the organ at the end of diastole before the vagus nerves had been excited.* Nevertheless—and this seems to me to be a point of some significance in its bearing upon the capacity of the sphincter muscle to close the mitral valve completely in conditions of dilatation—the ventricular contractions are less completely made; *there is less complete systolic shortening of the ventricular fibres,* due to the more distended condition of the ventricles and the increased contraction-volume. This being the case, the systolic constriction of the auriculo-ventricular orifices must also be less complete. The effect is the same, whether the vagus be directly stimulated or indirectly by reflex action, excepting that in the latter case an important element may be added, namely, a rise in the arterial pressure which still more tends to dilate the heart. Stimulation of the vagus may further cause physiological irregularity of the heart, as a necessary consequence of the arrangement by which the vagus governs the heart.

An opposite effect is observed when the *nervi augmentores* are excited *directly and alone,* for then, beside an acceleration of the heart-beat, the force of the ventricular contractions is increased so that the ventri-

cles contract more completely and diminish the amount of residual blood, in spite of the fact that the arterial pressure is raised at the same time.

But when the augmentors, alone or together with the vagi, are *indirectly* excited by stimulation of a sensory nerve, the effect upon the expansion of the heart often resembles that seen in excitation of the vagus, for the rise in arterial pressure is not always completely counterbalanced by the increase in the force of the heart's contraction, and the heart becomes expanded in diastole and systole. In other words, the result is physiological dilatation. It is obvious that this reflex excitation more nearly approximates the physiological excitation which occurs in the organ, however great the divergence may be, and though these experimental effects may not exactly express what does normally occur, they demonstrate the possibilities.

As Roy and Adami point out:

"The importance of this want of accordance between the increase in the force of the left ventricle and the increase in the work which it is called upon to do, can hardly, we think, be overestimated, and in a future section we will make such comments upon it as appear to us of practical interest to the physiologist and the physician; in the meantime we need only say that the physiological dilatation of the left ventricle, which often enough shows itself in spite of augmentor action is, in the hearts of healthy, well-fed animals, moderate in amount, and does not lead to any diminution of the output of the organ. In the case, however, of animals with weak hearts, this physiological dilatation may assume excessive proportions, and may lead to failure of the auriculo-ventricular valves and diminution of the output of the heart; in other words, to heart failure from inability to meet an increase of work which a healthy, well-fed heart can bear without difficulty."

One of the most valuable results of the work of Roy and Adami has been to show that the heart within purely physiological limits is not an organ of definite size, but contracts and expands in accordance with an automatic mechanism by which it adapts itself to the work to be done, and when expanded the circular fibres shorten less than when the heart is of smaller dimensions. It is a pump, but a pump that changes its size from time to time according to the work it has to do.

There is, then, such a thing as physiological dilatation and physiological incompetence. They represent the adaptation of the organ to the work to be done. Pathological dilatation differs from the physiological variety only in degree, and is a result of the same law, viz., a disproportion between the work to be done and the power to do it. One may shade into the other when the forces that produce physiological dilatation become excessive. It is then quite possible that from purely physiological variations of the working of the heart we may have disturbances of its functions which are essentially the same in character as those met with in pathological conditions, namely, valvular incompetence, irregularity, and other variations of rhythm.

II. Clinical Conditions of Health in which Physiological Dilatation and the Mitral Sphincter are Factors.

While Roy and Adami were pursuing their experimental studies the reader was engaged in a series of observations on the clinical side, but which in some respects took on the character of an experimental study, namely, the action of the heart under intense nervous stimulation, as shown by the occurrence of murmurs.[1] For some years previously I had noticed, in examining the applicants for the Boston Fire Department, a very unusual and to me, then, unaccountable frequency of heart murmurs. The conditions of the examination were such that a large proportion of the men were under strong emotional excitement. This was shown by the frequent occurrence of violent heart action, general nervousness, and tremor of limbs and voice. A systematic study was finally undertaken; the heart was intentionally artificially stimulated as much as possible by the method of examination. The applicant was ushered into the room without warning of what was to occur; he was urged to be quick in his movements and prepare himself as rapidly as possible, and the heart was examined as the first event. The ordeal was made as exciting as possible, and, as a matter of fact, the heart in a large proportion of cases was found to be working under intense stimulation and doing—if the force of the heart's beat on the chest-wall and the loudness of the sounds be criteria—an increased amount of work. It is important to bear this in mind in studying the results.

The total number of cases in the first series examined was eighty-six. Of these nine were thrown out on the ground of disability from organic disease, there being evidence of an enlargement in six, and in one of irregularity. The rejection of seven of these I now think was a mistake. However, in the seventy-seven remaining, mitral systolic murmurs were heard in twenty-five. So-called exocardiac or cardio-pulmonary murmurs were taken into account, examined for and excluded. Still, I feel sure that in some instances these were confused with endocardiac murmurs, and the total frequency of murmurs thereby increased. In a second series of eighty-five cases exocardiac murmurs alone were heard ten times, while in fourteen cases true endocardiac murmurs were heard.

To determine the relation of these murmurs to nervous excitation, in the first fifty-six subjects the heart was examined under the same conditions as in the first series; in the last twenty-nine the heart was examined last, after reasonable time had been given to the applicant to become accustomed to the ordeal. The result was that in the first fifty-six subjects the mitral systolic murmur was heard eleven times, and an exocardiac (cardio-pulmonary) murmur nine (or more) times.

[1] The Occurrence and Mechanism of Physiological Heart Murmurs (endocardial) in Healthy Individuals. Medical Record, April 20, 1889.

In the last twenty-nine subjects a true mitral murmur was heard only three times and an exocardiac murmur once.

In a third series (not hitherto published) out of a total of 103 individuals, and omitting two cases in which there *might* have been organic disease, systolic murmurs at the apex were heard in 21.

As corroborative evidence of the occurrence of these murmurs *under these conditions*, I asked Dr. J. H. McCollom to note the number he found independently in his examination of applicants for the Police Department. He stated that in a first series he found 27 mitral murmurs in 200 men, and in a second series of 111 men, 18 such murmurs.

In a *fourth series* of my own the conditions of the examination were altered so as to eliminate all emotional excitement. The result was that only a so-called pulmonic systolic murmur was heard three times, once being accompanied by a " mitral systolic of a temporary character," but heard after forced expiration. Hundreds of cases have been examined in the same way since this time. Only occasionally in a nervous individual will a functional murmur be heard, perhaps in 1 or 2 per cent. of the cases.

I have given the statistical results of these observations, but I do not wish to lay any great emphasis upon the figures from the point of view of *interpretation* of the sounds heard. Only one who is in the habit of making examinations of this kind can realize the difficulty of always correctly distinguishing between an exocardiac or cardio-pulmonary murmur and a true mitral murmur. They sometimes simulate each other in an extraordinary way. In some cases the short time given to interpret the character of a murmur, owing to its rapid evanescence with the allayment of nervous excitement, makes it extremely difficult to classify it correctly. This and the fact that many exocardiac murmurs in their physical peculiarities closely resemble true mitral murmurs, in spite of all rules regarding their differences, make it certain in my mind that some of these murmurs, though tabulated as endocardiac, were really exocardiac. For instance, it was only lately that I had the opportunity to listen to an extremely loud systolic murmur at the apex. It was heard still louder in the axilla, and was plainly heard in the back. For this reason for the moment I thought it was mitral, but I was soon able to make out that the pitch and quality were pulmonary, and it was heard to the left rather than over the apex. There was another murmur of different quality to be heard at the apex, but this was probably transmitted from the base, where there was a so-called " pulmonic " systolic murmur. Both subsided after a few minutes. The first murmur I believe to have been cardio-pulmonary.

I do not, therefore, lay any stress upon the statistical frequency of this mitral murmur. The figures I have given are, I have no doubt, too high. The important fact is that, without reference to fre-

quency, a greater or less number of murmurs indicative of mitral regurgitation do occur under the conditions of observations, viz., extraordinary nervous excitation of the heart. As I have already described[1] at some length the character of these regurgitant murmurs, and given the reason for this interpretation, a brief statement on this point must suffice.

1. Their physical characteristics, including location, point of maximum intensity and transmission fulfil all the requirements of a mitral murmur.

2. The only murmur for which they could be mistaken is the cardio-pulmonary, and in doubtful cases, not uncommonly two distinct systolic apex murmurs could be heard, one distinctly cardio-pulmonary; the other evidently must have been regurgitant.

3. They were persistent after forced expiration.

4. In a large number of cases, a systolic murmur of similar character was plainly audible in the second left intercostal space, either close to or about one and a half inches from the sternum, the so-called pulmonic murmur, which is regarded by many observers (Balfour, Naunyn, and others) as due to mitral regurgitation.

5. They are sometimes heard at the junction of the fourth rib and sternum on the left (*i. e.*, over the mitral valve).

6. The pulmonic second sound, as might be expected, is rarely relatively or absolutely accentuated, owing undoubtedly to a synchronous rise of arterial tension and because of the small amount of mitral leakage.

In my first communication the explanation which was given of these mitral murmurs was that *under strong nervous excitement the powerful contraction of the circular fibres of the heart so increased the pressure within the cavity of the ventricle*[2] *that the mitral sphincter is forced, so to speak, that is, it is either dilated or prevented from contracting sufficiently for a complete closure of the auriculo-ventricular orifice. Thus a functional regurgitation occurs.*

This mechanism I still believe to be an important factor in the case, but in the light of Roy and Adami's experiments the question of a possible accompanying and co-operative physiological dilatation of the heart assumed importance. It, therefore, became imperative that these observations should be repeated for the purpose of making accurate measurements of the size of the heart.

At the time of my first series of observations (1888) it never occurred to me, nor was it generally known, I think, that the healthy heart might dilate under conditions of increased effort (aside, of course, from quasi-pathological fatigue following excessive muscular exertion), so that

[1] Medical Record, April, 1888.

[2] The same thing may be true of the right ventricle.

when evidence of enlargement occurred the case was thrown out as possibly organic. *Six cases*, as before mentioned, *were rejected for this reason*. This, in view of later evidence, I believe to have been an error, and I am convinced that these cases were merely examples of functional dilatation. For in the first place, nine cases out of eighty-six men are far too high a proportion for heart disease to exist in presumably healthy men in the prime of life; and, second, I do not find anything like that proportion of existing organic disease under the present conditions of examination.

The third series of observations was, therefore, made for this purpose. Slight enlargement is not easy to demonstrate. Percussion is a very inexact method when precision is required, as has been shown by F. H.

FIG. 1. FIG. 2.

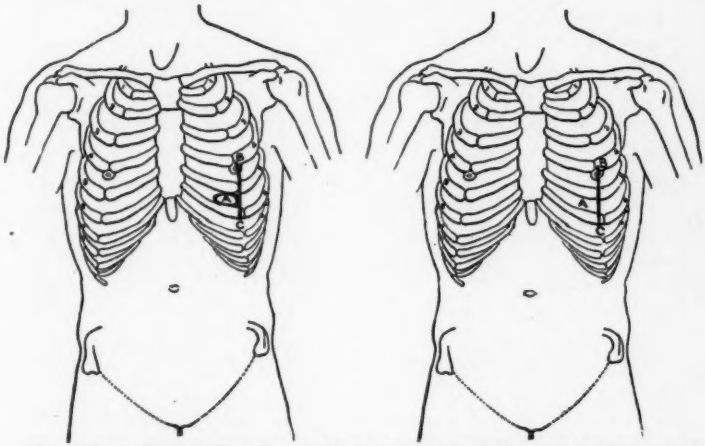


FIG. 1.—No. 42 (August, 1889). The apex-beat (A) was violent and occupied a larger area than usual. In this and Fig. 2 the line of dulness along left border only of heart is shown.
FIG. 2.—No. 85 (same date). Loud and low-pitched mitral systolic murmur.

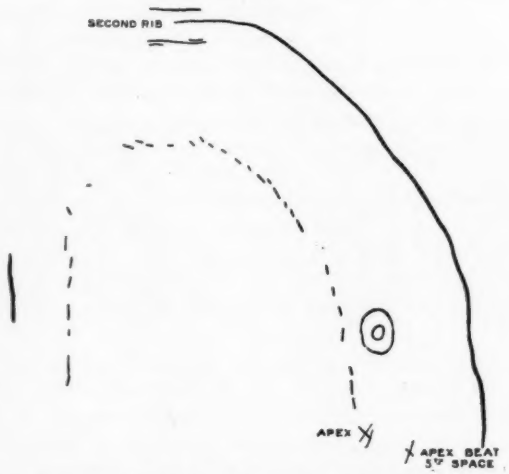
Williams' observations with the radiograph.[1] Percussion dulness cannot always be relied upon to correspond exactly with the outline of the heart. The position of the apex (as well as the apex-beat) of the heart is sometimes more exact, but it also has its fallacy aside from tilting.

Nevertheless, in this series I was able to satisfy myself of the presence of fugitive enlargement to the left in quite a number of cases. In them the line of dulness along the left border of the heart extended through the nipple, and the apex-beat could be seen or felt in this same line, and even well outside of it. Sometimes at the end of the exami-

[1] Philadelphia Medical Journal, January 6, 1900.

nation it could be seen that the apex had receded to its normal territory and the line of dulness had also receded—that is, as the excitement subsided the heart retracted. Thus, in about 10 per cent. of all cases an enlargement to the left was present, sometimes without murmurs. (See Figs. 1, 2, and 3.) Fig. 3 is particularly interesting. It is a late observation, and was made by first outlining the heart on the chest-wall by percussion, and then transferring by tracing-paper. The continuous line is that of cardiac dulness at the time of nervous excitement; the broken line the same after the heart had become quiet. The difference in the size of the heart is quite remarkable. The enlargement is to the

FIG. 3.



From tracings. Heavy line = cardiac area (dulness) during excitement; enlargement to right as well as to left and upward; broken line = same after subsidence of excitement same day and also six days later. × = apex-beat. During period of excitement, May 19, 1900, heart's action irregular, "pulmonic systolic" murmur (in left auricular area), loud cardio-pulmonary murmur to left of apex; after cessation of excitement disappearance of murmurs, and heart normal in every way. May 25th, heart still normal.

right as well as to the left and above. The extension of dulness upward is interesting in connection with the experiments and observations of Foxwell, who has shown that this feature is characteristic of the condition of the heart in which the so-called pulmonic systolic murmur is heard. He offers experimental evidence to show that it is due to the dilatation of the conus arteriosus, and the murmur to a distortion of the pulmonary artery, the dilatation itself being the consequence of debility. In the case from which this diagram was made at the time of the enlargement and excitement, the heart's action was irregular, and a

systolic murmur was present in the second space, heard loudest over the left auricle—that is, about one and one-half inches from the sternum. It was this case in which the very loud (presumably) cardio-pulmonary murmur (p. 195) was heard.

During the course of the examination the heart became quiet and retracted in size, and then the murmurs disappeared. Six days later, when examined again, the heart was still in every way normal.

I have thus been able to convince myself that in a certain proportion of cases the presence of dilatation is of a temporary nature. The following may be cited as examples:

No. 7 (already mentioned). At first, while the murmur was present, the apex-beat could be detected outside of the mammillary line. Later, at the end of the examination, the apex receded inside the mammillary line, but close to it.

No. 12. Mitral systolic; a strong apex-beat outside the mammillary line; heart action rapid and violent. A loud systolic murmur could be heard over the aortic orifice; also over the pulmonic. It may have been this murmur that was continued to the apex. Subject very nervous, voice tremulous. Later, murmurs disappeared, heart became quiet, and the apex-beat scarcely visible, and retracted close to but within the mammillary line.

No. 14. Heart-sounds normal; apex-beat in the mammillary line; heart's action violent. Later, the apex-beat receded inside the mammillary line.

No. 31. A rough mitral systolic murmur at the apex; apex-beat in the sixth space at the inner edge of the mammillary line.

No. 37. Mitral systolic murmur; percussion dulness extended on the left through the mammillary line. When examined some days later all these murmurs had disappeared and the line of dulness had retreated to within normal limits.

No. 42. At the beginning of examination, mitral systolic murmur, which later disappeared. Heart's action rapid and supernormal in strength; apex-beat could both be seen and felt close up to the mammillary line, extending over a wider area than normal. The line of the percussion dulness extended also through the mammillary line.

No. 58. First sound at the apex normal, but a systolic murmur could be heard over the aortic opening and continued in the carotid. The apex-beat could be felt with the finger in the mammillary line, and percussion gave the left border of the heart as extending through this line. When examined a few days later all these murmurs had disappeared and the line of dulness had retreated to within normal limits.

In some instances, as would be expected, there were evidences of enlargement of the heart without any signs of incompetency of the valves; for example, Nos. 14, 34, and 36. In a great many instances when I have examined these subjects some days later under circumstances that allayed all apprehension, the murmur previously heard had entirely disappeared, as well as all signs of cardiac dilatation. To these cases I would also add the six instances in the first series of observations,

which were eliminated because of the enlargement of which I had found evidences, and because of which I had concluded that they were probably of organic origin.

In the light of these findings, then, I think we may conclude that under intense nervous stimulation of the heart, *presumably tending to increase the work done*, there may occur a physiological dilatation of the heart similar to that which occurs when the pressure is raised by the methods employed in the physiological experimentation already referred to, and that the mitral sphincter also shares in this physiological dilatation. This means that its contraction—that is, the shortening of the circular fibres—is less complete, and the orifice is larger at the end of systole than normal. In consequence of this and of the increase of internal pressure, the contraction of the sphincter may be impeded, or the opening may even be expanded by the hydrostatic pressure, and the valve may become incompetent and regurgitation may take place.

I have omitted various details of these observations for the sake of brevity. It ought to be noted, however, in evidence of the intense stimulation of the heart that was usually present, that murmurs were frequently heard over other regions of the heart than at the apex. (Sir W. Broadbent has lately pointed out the frequency of murmurs over the various orifices of the heart in subjects undergoing civil-service examinations, and to this extent has corroborated the accuracy of these observations. He warns against the danger of mistaking them for evidences of organic disease.) The heart's action was usually increased in rapidity, sometimes to a very high degree, and its action was often violent and tumultuous. The apex-beat was sometimes diffused over an area of about double the extent of that which is normal. It was quite common to have all these signs disappear during the course of the examination, even while one was listening, and to see the increased cardiac area retract within normal dimensions.

In line with these observations of my own are those of Dr. John C. Munro,[1] who made an investigation into the condition of the heart in fifty-seven patients before and after surgical operations. The conditions before operation were considered to be those of apprehension and nervousness. Of the fifty-seven cases there was a group of fourteen in whom there were evidences of cardiac disturbance before operation, all signs of which disappeared as soon as the operation was over. In thirteen of these cases there was a systolic murmur at the apex; in the other one a presystolic murmur. Beside these there were six other cases which exhibited functional disturbances which persisted after the operation, while eight, it was thought, had well-marked organic disease, a very high and suspicious percentage. These findings of Dr. Munro seem to be corroborative of the observations which I have just recorded.

[1] Boston City Hospital Reports, Series VIII., 1897.

In 1890 Theodor Schott demonstrated by examining the hearts of strong, healthy men, before and after wrestling, that strenuous exercise, when intense, though of short duration, brings about a temporary dilatation of both sides of the heart. After a few minutes' severe wrestling, continued to a point to produce dyspnœa, an enlargement, shown by percussion, was produced both to the right and to the left from one to two centimetres and more. This dilatation duly subsided after a short rest; it does not appear, however, from Schott's observations, that the mitral sphincter was physiologically incapacitated by this dilatation, for he failed to find any regurgitant murmur, nor is any mention made of pulmonic murmurs, a rather striking contrast with the findings of others after long-continued and violent exercise sufficient to produce exhaustion. Schott interpreted this dilatation as the expression of an overstrain of the heart, and so stigmatized it with a pathological soubriquet. Overstrain is a clinical term, and is not descriptive of the physiological or pathological process. It may mean much or nothing. From the fact that there was no evidence of regurgitation it must be presumed that the contraction of the auriculoventricular sphincters were still sufficiently extensive to close the orifices. From this and also from the fact that the wrestling was continued only three or four minutes, we are compelled to conclude that neither the internal pressure was sufficient to force the sphincters, nor was there true fatigue or excessive dilatation. A more correct interpretation would seem to be that the dilatation observed was simply physiological and identical with that observed in animals when the heart is called upon to do any great increase of work.

There is an economy in this physiological dilatation. According to mathematical laws, when the heart is dilated—that is, when the circumference is increased—a smaller amount of contraction will suffice to throw out a larger volume of blood. For instance, if the heart were a sphere of ten inches in circumference a contraction of the circumference of one inch would throw out 4.5 cubic inches of blood, while if it were only five inches in circumference the contraction would throw out only a little over one cubic inch,[1] and this is what occurs in physiological dilatation. A greater amount of blood is thrown out at each systole with diminished contraction. With a dilatation of moderate amount the degree of contraction is sufficient to close the auriculoventricular orifices. But if the dilatation is excessive, either from great increase in the work to be done or weakening of the cardiac muscles, the contraction may not be sufficient in extent to close the orifice. As a rule, even with considerable dilatation, so long as the muscle is not fatigued, the contractions of the sphincter are sufficient,

[1] Roy and Adami.

but when fatigue sets in the contractions become shorter, the dilatation greater, and incompetency results.

It is interesting in this connection to notice that Schott found that by constricting the abdomen with a belt, and thus increasing the amount of blood flowing into the right ventricle, and thereby the amount of work to be done by the heart, the dilatation was thus further increased. This is in entire corroboration of the experimental observations on animals (Roy and Adami, Fry and Krehl), which have shown that compression of the abdominal veins causes dilatation of the heart by increasing the total output—that is, the work done. (Therein is a practical suggestion as to the possible ill effect of tight lacing.)

Later, in 1897, in another and similar series of experiments, Schott confirms these earlier observations by means of the skiagraph. The X-ray showed that the enlargement of the heart from side to side after strenuous exercise, wrestling, might be as much as 3 or 3½ cm. He also demonstrated the same thing after severe walking or bicycling. Undoubtedly fatigue of the cardiac muscle enters as an element in this cardiac dilatation when the enlargements follow persistent and long exercise, and itself is persistent. Very interesting in this connection is the series of clinical cases which Schott gives of persistent dilatation of the heart following extended muscular exertion. This enlargement took on a pathological character, and more correctly may be regarded as the expression of overstrain of the heart or muscular fatigue. This dilatation followed various forms of muscular exertion, including bicycling, manual labor, and dancing combined with tight lacing. The symptoms were disabling and those usually observed in cardiac incapacity.

III. Quasi-pathological Conditions, in which Physiological Dilatation and the Mitral Sphincter are Factors.

In Schott's experiments there was no mitral incompetency, or at least this was not revealed by auscultation. It was otherwise with the observations of Williams and Arnold of the hearts of the contestants in a Marathon running race of twenty-five miles. These are among the most valuable facts thus far recorded to determine the effect of fatigue upon the *human* heart. Of the ten men examined both before and after the race, seven showed after running a relative increase of the cardiac dulness extending to the left. It is interesting to note that the line of dulness corresponding to the left border of the heart, as shown by the published diagrams, extended through the nipple and agreed very closely with the same line which I found in my own observations where there was increase of the cardiac area and with some of Schott's cases. In eleven out of thirteen men, murmurs were noted. In all cases these were systolic, and the authors, after an extended discussion, interpret them as of mitral origin. In explanation of this the authors adopt

the view that fatigue induced a dilatation of the walls of the heart, including the mitral sphincter. In consequence of this physiological dilatation the auriculo-ventricular valves closed imperfectly, and regurgitation was allowed to take place.

Curiously enough, almost on the same day that Williams and Arnold presented the results of their observations to the Climatological Association, Stengel reported to this Association a similar series of observations of the hearts of athletes before and after running. He also found enlargement, and in some cases this enlargement was accompanied by mitral regurgitation. Stengel remarks that he has noticed the ease with which a systolic murmur developed over the hearts of men in the early part of their training for the football field when they are presumably out of condition. In a special trial of nine of the candidates he found that three promptly developed a very distinct murmur of this kind after a little exertion.[1]

[Since this paper was presented the writer had an opportunity to take part in the examination of the Marathon runners this year. For certain reasons the examination of the hearts was not entirely satisfactory. Murmurs were not heard, owing, probably, to tardiness in the examination, but enlargement was plainly demonstrable in most cases.]

The interest of these phenomena lies in the fact that they represent a general law. The dilatation and incompetency must be held to be the physiological result of increased work done, with diminished power to do it. Under the primary increased stimulation the heart expands and throws out a greater volume of blood; then the organ becoming fatigued the power is diminished and thereby the work is relatively still further increased, dilatation increases, and incompetency finally follows.

These observations of Stengel, with those of Williams, and Arnold, and my own, seem to me to be a complete physiological confirmation on the human subject of the experimental work by Roy and Adami on the dog's heart.

IV. Pathological Systemic Conditions in which Physiological Dilatation and the Mitral Sphincter are Factors in Determining Cardiac Disturbances.

As is well known, there are quite a number of conditions in which temporary mitral systolic murmurs are heard, often with enlargement. The most common conditions which these murmurs accompany are anæmia, Bright's disease, gout, arterial sclerosis, chorea, the infectious fevers, like diphtheria and typhoid, and even rheumatism. In some of these conditions there is presumably a weakened heart muscle—*e g.*, infectious diseases and anæmia and other adynamic states. In others

[1] Transactions of the Association of American Physicians, 1899. vol. xiv.

there is an increase of the arterial tension (Bright's disease, gout); in all cases enlargement is not infrequently present. Now, what I wish to point out is this: That the physiological principles underlying these cardiac disturbances is the same as in the experimental and other conditions which I have already discussed, and that the disturbances of function more nearly approximate physiological than pathological variations.

In my original paper I put forward the theory, as did also at the same time Roy and Adami, that the mitral systolic murmurs in these conditions represented physiological regurgitation due to incomplete contraction of the mitral sphincter; but to Donald MacAlister is due the credit of priority for this explanation, the first suggestion coming to him from Hesse's casts. As Roy and Adami put it: "When from any cause the muscular power of the heart is diminished, whether from imperfect blood-supply, fatty degeneration, or impaired quality of the blood, or from any of the known causes by which the power of contraction of the heart is impaired, we have a condition in which the relation between the work required of the organ and its power of doing that work is affected in an analogous way to that which occurs when the work of the heart is increased and its power remains constant."[1] In Bright's disease and gout we have an increase of the work to be done while the power remains unchanged; in the febrile diseases the work remains the same, but the power is diminished.

As all experienced practitioners are familiar with the murmurs occurring in adynamic states, it is not necessary to describe them at any length. In the course of Bright's disease it is not uncommon to observe evidences of temporary regurgitation from the left ventricle. I may cite here, for illustration only of what I mean, the case of a patient who was in the advanced stages of chronic Bright's disease, and also suffered from attacks of gout of a severe nature. The heart was very much enlarged, but no evidence of mitral incompetence, as a rule, could be detected. There were evidences of very high arterial tension. Every now and then he suffered from attacks in which a very loud mitral systolic murmur was heard at the apex. At such times marked œdema and congestion of the lungs were noticeable. Later these signs of mitral failure would disappear. Such attacks are usually called acute pathological dilatation or heart failure. The proper interpretation of cases of this kind unquestionably is that under the extremely high tension present there occurs a *physiological*, not pathological, dilatation of the mitral sphincter with diminished contractions, preventing complete closure of the valve. The work to be done becomes augmented, the heart physiologically dilates, but, not being strong enough to meet

[1] "Failure of the Heart from Overstrain." In other words, the mechanico-physiological effect is the same, whether the power remains constant and the work is increased, or the work remains constant and the power is diminished.

the strain, dilates too much and allows incompetence. With the disappearance of the high tension the muscle contracts again and the incompetence disappears.

Diphtheria offers a particularly favorable opportunity to study cardiac insufficiency due to weakness of the muscle, for it is known that the toxin affects both the pneumogastric nerve (and presumably the augmentor nerves) and the muscle substance. It is, then, a good type of that class of affections in which the auriculo-ventricular sphincters are weakened, and as such I speak of it. First-rate data for such a study are furnished by the reports and observations of many hundred cases in the Boston City Hospital made by McCollom[1] and Hibbard.[2] From a study of two series of cases (one, 800, and the other 252 in number) Hibbard found that a "systolic murmur at the apex, with an accentuated pulmonic second sound, and often with some enlargement of the cardiac dulness, is seen in about 10 per cent. of the diphtheria cases during the course of the disease." This murmur is temporary, for in twenty-four cases kept continuously under observation, it disappeared within three weeks in twenty-one cases and within eight weeks in the remaining three. The enlargement was found to extend in some cases in children as much as two centimetres outside the normal limit. Out of 121 fatal cases McCollom noted a mitral systolic murmur in eighteen cases, or nearly 15 per cent., and of these eighteen an enlargement was detected in six. In only one was there an enlargement without a murmur. An analysis of the cases which were fatal, chiefly from heart complications, and in which an autopsy was held (twelve in number), is instructive. Of these twelve a mitral systolic murmur was heard in seven. The auriculo-ventricular valves were found dilated *after death* in three, one or both ventricles dilated in five, and the heart enlarged by weight in eleven.[3] It must not be forgotten that the absence of dilatation either of the openings or the cavities after death is not evidence that it did not exist during life, as it is well known that after death the cardiac muscle contracts strongly (King, Sibson, and others).

A sufficient cause for the muscular weakness is found in the known action of the diphtheritic poison on the nerves of the myocardium. Thus, of five cases of mitral insufficiency the pneumogastric nerve was found diseased in all.[4] It is an instructive fact, and one demonstrating that marked dilatation is not essential for physiological regurgitation, that out of the eighteen mitral systolic murmurs McCollom reports

[1] A Clinical Study of Eight Hundred Cases of Diphtheria at the South Department of the Boston City Hospital. Boston City Hospital Reports, 1898, Ninth Series.

[2] Heart Complications in Diphtheria. Ibid.

[3] The cause of increased weight was not determined.

[4] In every case (9) where the nerve was examined it was diseased. In some the myocardium also was degenerated.

that no enlargement of the cardiac area could be detected in twelve. This properly interpreted means *that the mitral sphincter may not sufficiently contract, even though the dilatation is not sufficient to be detected by the usual methods of physical diagnosis.*

In view of the post-mortem findings, the mitral murmurs in this class of cases unquestionably represent regurgitation. In those cases where regurgitation occurs without the coexistence of dilatation the only intelligible conception of the conditions present is that the mitral sphincter is so weakened by disease that it does not sufficiently contract against even a normal or subnormal arterial tension.

In those cases where there is dilatation there does not seem to be any reason to suppose that the etiological principle is not physiological rather than pathological, or that it differs in any way from that which has been experimentally demonstrated to obtain in healthy animals. The work to be done by the heart is relatively increased—that is to say, the work remains the same, but the power is diminished; hence the heart is called upon for increased effort, and physiological dilatation results. This dilatation again increases the difficulty of the auriculo-ventricular sphincter.[1] Thus it is that the muscular inefficiency of the heart calls into play the physiological law of increased work. In other systemic conditions, like arterio-sclerosis, as I have said, there is no weakness of the cardiac sphincter, but an excessive increase of the work to be done (increased arterial tension).

V. Pathological Conditions of the Heart in which Physiological Dilatation and the Mitral Sphincters are Factors in Determining Disturbances of the Organ.

Space will not allow me to do more than allude to some of the perturbations which complicate the phenomena of cardiac disease and which are occasioned by these physiological factors.

If these factors, dilatation and sphincter action, are physiological laws, *they must be universal in their action, and affect diseased as well as normal hearts.* And hence it well may be that, looked at from this point of view, some of the commonly observed manifestations of heart disease may really be physiological in principle, exaggerated perhaps by the fact of the organ being incapacitated.

From the point of view of practical therapeutics this distinction at once becomes important. The conditions of "overstrain" of the heart, with relatively persistent dilatation and mitral incompetency, "fatigued heart," "curable mitral regurgitation" and acute dilatation, I need not

[1] In extreme cases, when the dilatation is excessive, the mitral incompetency may be caused or increased by the bulging of the walls, which, carrying away the chordæ tendinæ, prevents the valve flaps from coming into apposition. In most cases the dilatation is too slight for this.

more than allude to, as they have already been discussed. They are substantially one and the same condition, originating in and growing out of physiological dilatation from increased work. It may be that the difference between the physiological and the pathological is only one of degree. The tremendous strain sometimes put upon the heart necessarily induces a dilatation. To this "fatigue," as yet an incompletely known condition, becomes added and the dilatation becomes persistent.

The mitral sphincter necessarily shares in the inefficiency. When we bear in mind that by simply increasing the work the volume of the healthy heart may be so increased that its size at the end of systole may even be greater than it was before at the end of the diastole, and that the volume of blood thrown out may be quadrupled, we can appreciate the dilatation that may be affected by the enormous exertion to which the heart is sometimes subjected, and yet be physiological. Add to this "fatigue" and loss of muscular tone and the effect of the law is apparent. It was only lately that I was called to pass upon the condition of a man who had undergone great muscular exertion and had fallen down unconscious. On recovery he had developed persistent symptoms of cardiac disease, with dilatation (dizziness, pain, palpitation, cyanosis on exertion, etc.). He had been examined by several competent physicians, all of whom, I am told by the attending physician, diagnosed the case as "myocarditis." The subsequent history bears out the opinion that it was one simply of physiological dilatation and overstrain.

In fatty degeneration and other degenerative diseases of the heart the weakening of the myocardium tends to weaken the sphincter and make the heart dilatable under very slight exertion.

In valvular disease, especially in aortic stenosis, the increased work which the heart is called upon to perform tends to increase the normal dilatations which occur from time to time and to make less complete the action of the sphincters. In this way it seems to me are to be explained many of the acute dilatations and temporary mitral regurgitations which occur in the course of aortic disease. The increase of power coming from hypertrophy has the tendency to keep the dilatation within physiological limits, but sooner or later this compensation becomes inefficient.

The further application of these principles is readily made, and need not be further discussed.

All the observations to which I have referred in Sections I. and II. are particularly instructive as pointing to the very large variation that may take place in the size of the heart of the human being under actual conditions of life, and be within physiological limits. They render comprehensible that within physiological limits the mitral valve may fail to do its share in the closure of the mitral orifice. They contribute

to what might be regarded as the modern conception of the heart's workings and of a certain class of cases of mitral insufficiency which formerly were regarded as purely pathological, but now are recognized to be due to muscular weakness, and curable. The experiments on animals enable us to understand the *modus operandi* of the Nauheim treatment, for it has been experimentally shown that excitation of the peripheral nerves may reflexly stimulate the augmentor nerves of the heart, and through them increase the force of the contractions and the completeness of the systole, and diminish the quantity of residual blood —*i. e.*, diminish the size of the heart.[1]

A distinct recognition of physiological dilatation and physiological incompetency of the valves, apart from the pathological varieties, is of the utmost clinical importance aside from the advantages of precision of thought and precision of knowledge.

I feel quite certain that a clear understanding of these principles will help us enormously to a true conception of cardiac phenomena, whether accompanying organic disease or not. In any given case our first question should be: Are the conditions (murmurs, dilatations, irregularity) in part or wholly physiological, and, therefore, in part or wholly, temporary or permanent, curable or incurable? Upon the answer will largely depend both the immediate treatment and the rules for prophylaxis.

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[1] Roy and Adami.

REVIEWS.

SURGICAL ANATOMY. A TREATISE ON HUMAN ANATOMY IN ITS APPLICATION TO THE PRACTICE OF MEDICINE AND SURGERY. By JOHN B. DEAVER, M.D., Surgeon-in-Chief to the German Hospital, Philadelphia. In three volumes, illustrated by about 400 plates, nearly all drawn for this work from original dissections. Vol. I., Upper Extremity, Back of Neck, Shoulder, Trunk, Cranium, Scalp, Face. Vol. II., Neck, Mouth, Pharynx, Larynx, Nose, Orbit, Eyeball, Organ of Hearing, Brain, Male Perineum, Female Perineum. Philadelphia: P. Blakiston's Son & Co., 1900.

THE very handsome work, of which the first two volumes are before us, has proved one of the most difficult to review justly that we have met with for a long time. Let us glance at the modern history of anatomical teaching in order to gain a criterion of criticism. In the earlier part of the century just passed anatomy was essentially descriptive. In other words, it consisted of the successive and isolated study of the various so-called systems—the bones, muscles, arteries, nerves, etc. Something was said of the chief and most important relations of vessels, but in the main everything was considered by itself, it being apparently assumed that the learner would have the genius to combine these isolated facts. Surgical anatomy—the complement of descriptive anatomy—was for the most part limited to certain parts of the body where operations were most common. Probably more was written of the anatomy of the region of hernia than of any other; the male perineum, on account of operations for stone or stricture, coming next. Then there were the directions for the classical operations of the ligation of arteries and of certain amputations. Fasciæ received a great and probably an undue share of attention. The methods employed were those of dissection only, and the modern methods were unknown. Now surgical anatomy may mean the application of anatomy to the needs of surgery in those regions in which operations are likely to be performed, or it may be used as a synonym for topographical anatomy in its largest sense, by which we mean the relations of each part of the body with all its neighbors considered, not in the dissected or mutilated body, but on the living one; and treating of parts which under only extraordinary circumstances can be exposed to the scalpel, but whose relations are of great importance in the fields of diagnosis and pathology.

In the past generation a change that is indeed revolutionary or rather a series of changes have swept like waves over the field of anatomy. First of all, we have had the rise of the system of frozen sections and window cuts by which topographical anatomy took a great step and became less distinctly surgical. It is not too much to say that the normal form of many of the internal organs is only now being learned. The study of muscular action by Duchenne has been a great

step in applied anatomy. To the great changes in our ideas, especially of the central nervous system, wrought by embryology, we can but allude. Altogether the change has been immense since the days when the requisites for distinction in anatomy were pretty much limited to neat dissection and a good memory. Putting aside all purely scientific considerations, we may now say that the idea which above all others it is most important to get the student of medicine thoroughly to grasp is that both the physician and surgeon have to do with living men and women whose organs are not at all in the condition in which the student generally sees them. The knowledge he requires is of the shape and relation of the parts in the living body, not of them when isolated and distorted by post-mortem changes and by the very act of dissection. Now, surgical anatomy to be really good must be founded on this want. It should involve not only the knowledge of the parts most likely to be operated upon, but that of the whole body. At the same time some parts are of infinitely greater importance than others. Some structures in such a work should not even be mentioned, while others cannot be described too thoroughly. Physiological considerations can by no means be neglected. We need to know how a muscle acts and what is, in consequence, the result of its want of action or of its perverted action.

It is safe to say that the reader on opening these volumes will first give his attention to the plates, which are numerous and beautiful. By way of criticism we must say that many of the illustrations are decidedly too large. What is to be gained by devoting a whole page to the auricle or to the eyeball? The result is sometimes coarse, and even when it is not a diminishing glass shows how much preferable a smaller scale would have been. We should take up much space were we to give praise in detail, but we must mention the beautiful and instructive views of the middle ear shown both by section and dissection. The sections are, with a single exception, very good indeed. Those of the male and female pelvis are admirable. We wish that this method had been employed very much more freely. The one which we have called an exception is a median section through the nose, mouth, and pharynx. It is evident that the specimen had been detached from the spine. If we are not very much mistaken the mouth and pharynx have been distended with some foreign substance, hardened, and cut. What is the result? We see in the first place that the pharynx and œsophagus bulge backward, presenting a space that is not there in life; that there is a large space between the tongue and the roof of the mouth, and that the soft palate presents a graceful but perfectly impossible curve in mid-air. Now this is not a true section in the sense that those made on untouched bodies hardened either by cold or formalin are, and the idea that it gives is a wrong one. It is the section not of the true pharynx, but of an artificially prepared one. We dwell on this because it is an error incidental to what we consider the great defect of the work.

This defect is the method and point of view. To exemplify this, let us take as an illustration the first part, which deals with the upper extremity. First comes the surface anatomy, beautifully illustrated and well done, followed by special directions for nerve stretching and nerve section. Then the skin being removed (and what a perfect view there is of the subcutaneous tissue) we come to the parts beneath. The relations of the axillary fascia are finely shown and further explained by a diagrammatic section, and the relations of the lymphatics, especially

those of the breast, are well treated. It is when we get into the arm and forearm that the faults we object to so strongly become accentuated. The muscles, vessels, and nerves are described *seriatim*. In some cases these are treated with what one may call personal attention, but too often the description is short, perfunctory, and too suggestive of that to be found in a compendium.

It seems a pity to give the space in a work of so great scope to what the reader should be supposed to know already, especially (and now we come to the heart of the matter) when these descriptions are given one after another. There should have been either much more or very much less. There are errors, too, that one would not expect. Thus the extensor communis digitorum is described as inserted into the second and third phalanges. It is known that practically its action is on the first and that the others are extended by the muscles of the hand. Indeed, in another place the true insertion is correctly described and finely figured. All the joints, from those of the clavicle down, are successively described, and by no means fully. In short, we have here the old method of giving us isolated parts when what we want is all those parts together. The anatomy of the bones is almost completely ignored, though surely there is a good deal worth saying about their shape at different levels and the varying thickness of the solid osseous tissue. In the section on amputation it is thought advisable to enumerate the various structures divided. We beg leave to quote from the description of amputation through the middle of the forearm: "The anterior incision is semilunar, with its convexity downward, passes from one border of the forearm to the other, and divides skin, superficial fascia, the radial, median, and anterior ulnar veins, the anterior branch of the musculo-cutaneous nerve, the anterior branch of internal cutaneous nerve, cutaneous branches of the radial and ulnar arteries, the deep fascia, the flexor carpi ulnaris, the ulnar vessels and nerves, the flexor sublimis digitorum, the palmaris longus, the flexor carpi radialis, the median nerve and artery, the flexor profundus digitorum, flexor longus pollicis, the radial vessels and nerve, and the supinator longus." We spare the reader the contents of the posterior flap. The time was when we should have looked upon this as the summit of anatomical erudition, but those days are long past. Here is our complaint in a nutshell: the anatomy is essentially that of a past epoch. It were easy to cite instances in support of this criticism. Take, for instance, the orbicularis oris and the muscles mingling with it. There is no hint at the present view that even the existence of the orbicularis as a real muscle is at best very problematical, and that others which are here described as ending at the angles of the mouth form a large part of it. In the account of the brain and cord we find that sensory nerves are still supposed to have their origin within the central nervous system. Nothing, however, shocks us more than the position of the kidneys in the diagrammatic figure of the relations of the viscera to the back. It is hard to conceive how they could have been so placed by one at all familiar with the sectional method of studying the abdominal viscera.

Perhaps we have given too much weight to this fundamental criticism, but we must write as we think. If we do not praise more it is not because we cannot find much to praise. As an example of terse, correct, and facile description, take that of the course of the hypoglossal nerve.

We do not doubt that the book will appeal to many, and, indeed, we can but wish success to so much painstaking and conscientious work, though the author's idea of a topographical and applied anatomy is not ours. T. D.

FORTY YEARS IN THE MEDICAL PROFESSION, 1858–1898. By JOHN JANVIER BLACK. Philadelphia: J. B. Lippincott Company, 1900.

IT is observable in connection with the wide-spread increase of interest in all matters bearing on the early history of this country that there has also been shown a marked desire on the part of medical men to learn more of the rise and progress of their profession in America. The proceedings of medical societies and the medical journals have of late contained many contributions bearing on the subject which have served to show what an incompletely-worked mine of material lies at the disposal of those inclined to delve in it. Few books of real value on medical history in the United States have been published since 1828, when old James Thacher published his *American Medical Biography*, a book of surpassing worth and interest. Thacher had been a surgeon in the American Army during the Revolution, and he wrote from personal knowledge of the medical worthies of his day—Rush, Morgan, Shippen and the others whose zeal gave the impetus which has placed medicine in its present exalted state in this country. Dr. S. W. Williams, in 1845, published a continuation of Thacher's work, containing biographical sketches of physicians who had died subsequent to 1828, neither of the books containing articles on physicians yet living at the date of their publication. At a later period Dr. Toner published several pamphlets which, though containing much valuable information, were incomplete and sketchy. After the death of Dr. George W. Norris, of Philadelphia, his son, Dr. William F. Norris, had privately printed some manuscript notes which his father left, under the title of "The Early History of Medicine in Philadelphia." This is a most interesting book, and very complete and accurate as far as it goes. Another very interesting publication is Dr. S. A. Green's *Centennial Address* before the Massachusetts Medical Society, in 1881. These may be considered the chief published sources of our knowledge of the beginnings of medical science in this country. In older countries there is a profuse literature on medical history. Probably the best-known book on the subject in the English language is *The Gold-headed Cane*, which was first published in 1825, and appeared in a fourth edition in 1884. It purports to be the autobiography of a cane which had belonged in succession to the famous physicians—Radcliffe, Mead, Askew, Pitcairn, and Baillie, the latter's widow depositing it in the Royal College of Physicians. It is a most fascinating little *jeu de esprit*, and should be read by every physician who wants a few hours of recreation. In Germany there are professorial chairs for the teaching of the history of medicine, and the lectures are said to be well attended and of great interest and value to the students.

It is a trite saying that the conversation of doctors generally possesses great interest, because of the many phases of life and society with which they are thrown in contact in the performance of their professional

duties. It is curious to observe, however, that the autobiographies or biographies of physicians are rarely entertaining even to their professional colleagues, and that such books generally have very little literary merit. Of course, there are exceptions, such as *The Life of Marion Sims*, but they only serve to prove the rule. While there are hundreds of books of biography and sketches of lawyers, clergymen, and soldiers, transmitting anecdotes of their learning and wit, which are read and enjoyed by the veriest laymen, the great procession of physicians and surgeons passes along, leaving as almost its only literary record a series of technical books and articles which become antiquated within a few years after they are written, or a few jejune eulogies which are too dull and mendacious to repay perusal. Dr. Black has wisely refrained from calling his book an autobiography. In the preface he speaks of it as the flotsam and jetsam of his forty years of active practice, and the phrase well suits the nature of the book. In a hasty view of the events of Dr. Black's life it would not seem as though they had been of such a nature as to possess any great interest to those not personally acquainted with him. In 1860 he entered the medical department of the University of Pennsylvania, and, graduating after the usual two years of study, he served as a resident physician in the Philadelphia Hospital (Blockley). In 1866 he went to Europe, and on his return entered upon the practice of his profession in the little town of New Castle, Delaware, where he has remained in active work ever since. Surely one would not be disposed to expect anything out of such a career justifying the publication of its history. But on reading the book one is agreeably disappointed. Dr. Black gives us the details of the course of study at the University, chiefly consisting of didactic lectures. There was no practical work in chemistry, and during his whole course he did not once look through a microscope. While a resident at Blockley there was an epidemic of typhus fever in its wards, and he describes the measures employed in its management. His description of the life of the medical student and the hospital resident of his time is very amusing. The great value of the book, however, lies in the author's vivid descriptions of the medical giants of those days with whom he was thrown in contact. His accounts of the great men who then made Philadelphia famous as a centre of medical learning—Pancoast, Gross, George B. Wood, and many more—describing their personal appearance and characteristics and their methods of working, are admirable. When he went abroad, in Paris he saw the work of Nelaton, Civiale, Trousseau, Velpeau, Ricord, and the great clinics held by them in the city's famous hospitals. In Berlin, Grafe, Langenbeck, and many others held his attention. He points out that Vienna then as now possessed unsurpassed clinical and pathological facilities, and he grows enthusiastic when recalling memories of the great leaders of the profession in England. These reminiscences and descriptions are wonderfully vivid and readable.

There is another feature of the book which consists in a presentation of the author's views on the many medical and surgical topics which have fallen to his experience in his professional life. From the details of a major surgical operation to the subject of animal extract therapy we find a full exposition of what Dr. Black holds the right view of the matter, given in the utmost detail. In one chapter he discusses ptomaines and autointoxication; in another the varieties of edible

fruits; in another rheumatism; in another surgical procedures and antisepsis. The subjects are all gone into in minute detail and occupy many pages. They show the author's active interest in every new development in medical science, but we wish he had continued his accounts of the men and things of former times and not given us a mass of information which we could readily obtain from our text-books. However, let us pardon this in consideration of the very many interesting pages which accompany it.

Dr. Black has evidently throughout his long life been a keen observer, and the alertness of his mind is indicated by the relish with which it grasps these new things. It is greatly to be wished that more medical men would emulate Dr. Black's example and write their memoirs for the edification of subsequent generations. Such autobiographies are of the greatest service, whether their authors have been eminent in their lives or not. If the latter lot has befallen them, let them then tell us about those who were more successful; if they have achieved eminence, let them recount the steps by which it was attained. Medical science is yet young in this country. Let us treasure up all we can concerning its progress. F. R. P.

PROGRESSIVE MEDICINE. A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES, AND IMPROVEMENTS IN THE MEDICAL AND SURGICAL SCIENCES. Edited by H. A. HARE, M.D. Vol. III. and IV., September and December, 1900. Philadelphia and New York: Lea Brothers & Co.

WE have already commented upon Vols. I. and II. of this series, and in doing so set forth their merit and their title to wide circulation.

Vol. III., the third issue for the year 1900, is taken up with a discussion of the Diseases of the Thorax and Its Viscera, including the Heart, Lungs, and Bloodvessels; Diseases of the Skin, Diseases of the Nervous System, and Obstetrics. The diseases of the Thorax are reviewed in a most comprehensive fashion by Dr. William Ewart, of London, than whom there are few more capable of handling it. The pages devoted to croupous pneumonia, pulmonary tuberculosis, and cardiac and general stimulants are particularly satisfactory in their presentation of the winnowing of a vast literature.

The contributions to Diseases of the Skin are considered by Dr. Henry W. Stelwagon. His review will commend itself to the general practitioner, because it bears the evidence of the author's personal opinion and because much space is devoted to treatment. The same applies also to the epitome of the literature of Diseases of the Nervous System, which is contributed by Dr. W. G. Spiller. The digest of the literature on brain tumor and spinal tumor is particularly commendable. The important additions to clinical neurology are set forth in a comprehensive and attractive manner, and the epitomist's comments are sound and to the point.

Dr. R. C. Norris, who considers the literature of Obstetrics, is impressed, after reviewing the recent contributions, by the growth of obstetric science, and remarks briefly that bacteriology has revolutionized obstetrics as it has surgery. Such an epitome as that presented

under "management of pregnancy and labor" can scarcely fail to be appreciated by the general practitioner, especially as it is supplemented by a summary of the line of treatment followed by the writer—a recognized teacher. The review concludes with an excellent and deserving summary of Hirst's valuable article on coccygodynia.

In Vol. IV. Dr. Max Einhorn requires but seventeen pages to review the literature of Diseases of the Digestive Tract and Allied Organs, Liver, Pancreas, and Peritoneum. It can scarcely be expected that an adequate account of the great number of contributions can be made in such space, especially as the larger portion of it is taken up with the writer's personal contributions to this literature.

The chapter on Genito-urinary Diseases and Syphilis is from the pen of Dr. William T. Belfield. The consideration of syphilis is particularly inadequate. This is one of the few chapters in the series that the reviewer has found distinctly disappointing. In marked contrast is the succeeding chapter on Surgery, a most praiseworthy and commendable review by Dr. Joseph C. Bloodgood. It gives the reviewer great pleasure, after having carefully read the 130 pages contributed by this writer, to testify that it conforms in every particular to his ideal of what such a review should be.

Diseases of the Kidneys are considered by Dr. J. R. Bradford, of London. Albumosuria, alkaptonuria, cystinuria—terms probably unfamiliar to most general medical readers—receive considerable space. The pages devoted to skin eruptions occurring in Bright's disease are well allotted.

Dr. A. P. Brubaker contributes a brief review of General Physiology, a large part of which has very "practical" application; and Dr. H. B. Baker a readable review on progress in Hygiene.

The concluding chapter, one which we venture to say will be more studiously conned and perhaps frequently consulted than any in the series, is a Practical Therapeutic Referendum, by Dr. E. Q. Thornton. Herein are displayed the new tools of the doctor's workshop, and some attempt is made to put a personal estimate upon their value.

Taking a retrospective glance at the volumes of *Progressive Medicine*, the reviewer is of the belief that they fulfil their purpose successfully and adequately. J. C.

A Text-book upon the Pathogenic Bacteria for Students of Medicine and Physicians. By Joseph McFarland, M.D., Professor of Pathology in the Medico-Chirurgical College, Philadelphia, etc. Third edition, revised and enlarged. Philadelphia: W. B. Saunders & Co., 1900.

The issue of a third edition of this book attests the favorable reception accorded it, and even a brief inspection shows the care that has been taken to keep it abreast of the rapid advances made by this branch of medical science. The new edition contains almost double the reading matter of the first issue, which appeared in 1896.

On taking up a work on bacteriology one almost instinctively turns to the pages on infection, immunity, and serum-therapy, topics of fascinating interest from a purely scientific stand-point, and of vast practical importance. This section has been entirely rewritten, and an unusual amount of space devoted to the problems involved, which are

presented in an admirable manner, though perhaps more fully than need be for the class of readers to whom the book is addressed. It is, however, probably the most complete discussion of these matters contained in any text-book in English, and those interested will find here a clear exposition of the various theories advanced from time to time with the arguments for and against them. The author falls into the error of giving credit to Ogata and Jasuhara for making the first observation on the protective power of immune blood, in 1890, an honor belonging to Babès and Lepp, who, in 1889, at the Pasteur Institute, carried out experiments to determine the protective power of the blood of animals immunized against rabies with a certain amount of success.

The chapters on Diphtheria and Typhoid Fever are especially interesting. In the former a full description of the methods of producing antitoxin and its standardization is given, subjects on which the author is well fitted to speak by his large practical experience. The latter treats at length of the Widal reaction and its application to the diagnosis of this widely distributed disease. The serum-therapy of the various diseases treated of receives a fair amount of attention, and the manufacture of the different "vaccines" is described.

The entrance of some errors into a book of this scope is possibly unavoidable. Certainly it is easier to pick a book to pieces than to construct one. The present work is not entirely free from errors, and some of the most noticeable must be pointed out.

The description of rabies as a "specific toxæmia" is scarcely borne out by our knowledge of this malady. The inoculation of rabbits under the dura mater with the medulla of a dog dead of rabies is said to produce the disease in about six days, while in a second rabbit inoculated from the first, "a more violent form of the disease in a shorter time" is caused. The period of incubation in the first instance is usually about three weeks, and seldom less than fourteen days. Only after a long series of inoculations is the period of incubation reduced to as short a time as six or seven days, and this is the strongest virus obtainable—the "fixed" virus of Pasteur.

In discussing tuberculosis we are told that "in bovine animals and sheep the infection is usually first seen in the alimentary apparatus and associated organs, and may be limited to them. Pulmonary disease sometimes occurs." In cattle as in man the lungs are the chief seat of tuberculosis. Statistics collected by the German Government show that the lungs are affected in 75 per cent. of all cases, and in this country we have more recent figures from two sources—one giving 78.4 per cent., and the other 60 per cent. as the proportion.

Some mistakes have crept also into the make-up of the book. The section on Bovine Tuberculosis has been placed in the middle of the section on Fowl Tuberculosis, and statements concerning the avian bacillus are made to appear as a part of the discussion of the mammalian organism. A number of typographical errors occur, and several of the authors quoted have their names badly misspelled.

Lack of space forbids the mention of many admirable features which deserve notice. As a whole, the book contains a clear and reliable exposition of the science of bacteriology as applied to medicine, and like the former editions will doubtless receive a cordial welcome.

It is well illustrated, and is printed in the attractive style characteristic of the publishers. M. P. R.

ATLAS DER NORMALEN UND PATHOLOGISCHEN ANATOMIE IN TYPISCHEN RÖNTGENBILDERN. Die angeborene Luxation des Hüftgelenkes (congenital luxation of the hip-joint) von Geh. Med.-Rat. Professor Dr. MAX SCHEDE. Hamburg: Lucas Gräfe u. Sillem, 1900.

ATLAS OF NORMAL AND PATHOLOGICAL ANATOMY IN TYPICAL RÖNTGEN PICTURES.

THIS work is a monograph of twenty-three pages, to which is appended a series of forty-four excellent reproductions of skiagraphs, which serve to illustrate very graphically the subject-matter of the text. The author goes over the subject of congenital dislocation of the hip systematically, setting forth his own views in matters in which he disagrees with the commonly accepted teachings of the day. After a brief historical sketch the author takes up the etiology, the direction of the primary luxation, incomplete luxation, and the pathological anatomy of the parts concerned. The hypothesis of Dollinger, who attributes this congenital malformation to a premature union of the epiphyseal lines in the acetabulum, the author is inclined to discredit. Such a phenomena as Dollinger describes will not be met with in more than 1 per cent. of cases, and should not, therefore, be regarded as an etiological factor.

Whatever may have been the condition in the first and second year of life, there is no doubt that in the majority of cases the head, at the time of the first observation, is displaced upward and backward, or, in other words, that the dislocation is upon the dorsum ilii.

Of the commonly described alterations in the structure of the head and neck, such as the flattening of the head and the variations from the normal angle between the neck and shaft, by far the most important, from the therapeutic stand-point, is the disturbance of relationship between the upper and lower ends of the femur. The upper end, and, therefore, the head, is in a position of outward rotation, while the lower end occupies a position midway between outward and inward rotation. The author continually emphasizes the absolute necessity of taking advantage of our knowledge of this fact when considering methods of reduction and methods of retention. The greater part of the monograph is devoted to the most interesting phase of the subject, namely, the treatment. Of the relative merits of the methods of Mikulicz, Hoffa, Paci, and Lorenz, the author considers the latter the most rational, for the methods of Mikulicz and Hoffa are only applicable to cases in which retention is attended with no great difficulty, while that of Paci is objected to on the ground that its application is limited also to a particular group of cases. Exception is taken to the position in which Lorenz places the limb after reduction, viz., that of outward rotation. According to Schede, no position seems to make reluxation easier than that of outward rotation; therefore, after reduction the fixation dressing should be applied with the limb rotated inward. On the assumption that the position of outward rotation is one which favors reluxation, the author recommends the performance of a subtrochanteric osteotomy by which this deformity of the upper end of the femur may be corrected. The operation is not performed until one and a half to three months—according to the resistance offered by the external rotators—have elapsed since reduction was effected, during

which time the limb has been in a position of abduction and inward rotation.

The technique of the operation: Every precaution being taken to prevent reluxation during its performance, a gold-plated steel needle is thrust in through the trochanter, neck, and half way through the head of the femur, the end of the needle projecting some 3 cm. from the cutaneous surface. By means of this needle the upper fragment can be placed after the osteotomy in the desired position. Having divided the bone just below the small trochanter by a linear subcutaneous osteotomy, the lower fragment is rotated outward until the patella looks directly forward, and with the limb in this position the plaster dressing is applied. The needle is not removed until union is firm, which will be about the fifth week. From this time on for a period of three to six months a plaster dressing reaching to the lower third of the thigh must be worn, together with a brace connecting the cast with the shoe, by means of which the limb is retained in the proper position. As to the results and the justifiability of such an operation, the author expresses his unqualified approval of it, and believes that with its adoption not only will a number of hitherto unimproved cases be materially improved, but a great percentage of all cases be cured. (This operation is precisely similar to one recommended by Kocher to correct the torsion of the upper end of the femur met with in coxa vara.) After commenting upon his method of reduction, the author in conclusion presents some statistics based upon his personal observations in 268 luxations in 182 children. Following the classification of Peterson to Group A, or that in which reposition was complete and the ultimate result perfect, belong forty-one patients with fifty joints, fourteen going without apparatus; to Group B, or that in which the head occupies a position in the upper and outer edge of the acetabular rim and in which function is good, belong sixty-one patients with sixty-six joints; in Group BC, that in which the head was displaced still further outward toward the anterior superior spinous process of the ilium, and in Group C, in which the head is immediately beneath this process, were (BC) nineteen children with twenty-six joints, and (C) twenty-seven with thirty-six joints; ten patients with sixteen joints belonged to Group CD, which corresponds somewhat to the class of supracotyloid and iliac luxations described by Lange. In twenty-two cases the treatment was for some reason given up, and in twelve cases, all between seven and fifteen years of age, either the luxation was irreducible or the head could not be retained after reduction. Of the series in which perfect results were obtained (Group A) 22 per cent. were cases of bilateral luxation as compared with 34.4 per cent. in Group B. Of the total number 111 were under seven years of age, the remaining seventy-one over seven.

The reproductions, which have been made from first-class skiagraphs, are most instructive and enhance to no small degree the value of this monograph as a work of reference. By one interested in congenital luxation of the hip, a subject which of recent years has attracted so much attention, this monograph will be read with interest, inasmuch as it represents the views of a noted clinician based upon experience and personal observation with a remarkably large series of cases. Of additional interest is the author's contribution to the treatment—subtrochanteric osteotomy—an operation which he is prepared to indorse

after its performance in some fifty cases—an addition to the mechanical therapeusis of this deformity, which he believes will be found to be of the greatest assistance in preventing recurrence after the luxation has been reduced. C. H. F.

TEXT-BOOK OF THE EMBRYOLOGY OF INVERTEBRATES. By DR. E. KORSCHELT and DR. K. NEIDER. Translated by Matilda Bernard. Revised and edited by Martin F. Woodward. Vol. IV. London: Swan, Sonnenschein & Co., 1900.

THE appearance of this volume realizes the long anticipated completion of the English translation of this excellent German work. The present part includes the development of Amphineura, Lamellibranchia, Solenoconcha, Gastropoda, Cephalopoda, Tunicata, and Cephalochorda.

The marked activity in the investigation of invertebrates during the eight years that have elapsed since the appearance of the German text has resulted in many advances and greater accuracy in our knowledge of the development of these forms. Such gains necessitate frequent modification, or complete revision, of the accepted views of a decade ago; the duties, therefore, of the editor of a text-book which shall be a trustworthy guide along scientific paths so subject to change are far from perfunctory. The task imposed upon Dr. Woodward in bringing the account of the development of the mollusks and the tunicates as originally written into accord with the results of the later researches in these groups has been no light one.

The section dealing with the Mollusca has been extensively revised by alterations and additions, so that it offers an excellent presentation of the development of this group. It is to be regretted that the chapters dealing with the Tunicata have not had the advantage of similar revision, since the repeated contradictions given to the statements of the original text by the necessary footnotes by the editor are conducive neither to the pleasure nor the patience of the reader.

The final chapter of the work on the Cephalochorda, by Prof. Neider, presenting an excellent outline of the development of the amphioxus, has a deep interest even for those especially engaged in following the embryology of the highest types, since study of the simplified developmental processes occurring in this low animal has materially aided in appreciating the significance of the complex relations presented in the most highly specialized, including man.

The systematic position of the amphioxus has long engaged the earnest thought of the foremost zoologists. The inclusion of the amphioxus within the discussion of the invertebrates, however, must not be taken as a denial of its generally accepted place at the foot of the vertebrate series, for the author concludes that the animal may be regarded as the "primitive vertebrate," enjoying, however, in a sense a certain independence of position. The view championed by Dohrn, that the amphioxus represents a degenerate form derived from the Craniata, is not accepted, but, on the contrary, the conclusion is reached, based upon the established facts of its ontogeny and anatomy, that this animal represents a very primitive form.

The closing pages of the book are devoted to the broad problem of the ancestry of the vertebrates. After pointing out the inadequacy of

a number of the assumed solutions of this vexed question, the author wisely adopts the conservative view that we are not at present in a position to decide from what primitive form the Chordata have been derived, and that "the origin of the vertebrates is lost in the obscurity of forms unknown to us."

The favorable opinion regarding the work of the translator and the character of the illustrations that we had occasion to express in the pages of this journal when reviewing the preceding volumes, is further confirmed. The completion of the work in its revised English dress will be welcomed by the steadily growing ranks of investigators whose admirable work is winning for American morphologists a deservedly high place. G. A. P.

DISEASES OF THE EYE, EAR, NOSE, AND THROAT. A Pocket Text-book of Diseases of the Eye, Ear, Nose, and Throat, for Students and Practitioners. By WILLIAM L. BALLINGER, M.D., Assistant Professor of Otology, Rhinology, and Laryngology in the College of Physicians and Surgeons, Chicago, etc., and A. G. WIPPERN, M.D., Professor of Ophthalmology and Otology in the Chicago Eye, Ear, Nose, and Throat College. In one handsome 12mo. volume of 525 pages, with 150 engravings and six full-page colored plates. Philadelphia and New York: Lea Brothers & Co.

IN a book of but five hundred pages one cannot expect to find a very complete treatise on diseases of the eye, ear, nose, and throat, and the statement made in the preface by the authors, that the more common diseases of those organs are treated "with a fulness commensurate to their importance," is hardly borne out in their work. The book, however, has many features of much merit. The authors have in a concise and clear manner described the symptoms and treatment of affections of the eye, ear, nose, and throat as they present themselves to the student and general practitioner. They have not filled their pages with anatomical descriptions copied from larger books, but have contented themselves with permitting the student to study his special anatomy from numerous well-executed plates. The illustrations throughout are especially good. Only a few of them are original, but these are judiciously chosen. Small text-books of this nature are undoubtedly of the greatest value to the student and general practitioner, and we can heartily commend the one before us as a most complete and practical manual of the essentials of the subjects treated in it. F. R. P.

A MANUAL OF HYGIENE AND SANITATION. By SENECA EGBERT, A.M., M.D. Second edition. Enlarged and thoroughly revised. Philadelphia and New York: Lea Brothers & Co., 1900.

THIS manual has been revised and new matter added to the extent of sixty-five pages. A chapter on Military Hygiene has also been added. The choice and treatment of the subject-matter, while it does not always conform to that of well-known works on the subject, is probably not directly open to criticism, except that the chapter on Bacteriology appears to be given undue prominence for a work of this nature. D. H. B.

PROGRESS

OF

MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

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The Tongue in Health and Disease.—J. MÜLLER has re-examined this subject. Considering the regularity with which the tongue is inspected it is not a little remarkable that so little positive knowledge is entertained. Müller reminds us that the coating of variable thickness on the middle of the dorsum of the tongues of most people in middle life is made up of the filiform papillæ. It is, therefore, a fur rather than a deposit, as is so often imagined. The longer the papillæ and the thicker the epithelium, the less does the red color of the tongue show, and the whiter or yellower is the surface. At times the papillæ reach excessive size, the epithelium is horny and contains dark pigment, hence the name "black hair-tongue." As the epithelium becomes loosened and infiltrated by bacterial growth, the cloudy, yellowish-gray appearance is exaggerated, and may be further altered by ingesta such as berries, chocolate, red wine, etc. Milk causes a white appearance by reason of the fat globules. The desquamation of cells and the accumulation of food remnants, mucus, leucocytes, and bacteria cause a coat that can be removed by brushing or scraping. In health this sort of coat never becomes excessive, because it is removed in the taking of food, but in the morning is apparent on account of the resting of the tongue overnight. The author recommends for obtaining an idea of the activity of epithelial growth in the mouth the examination of sediment obtained by chewing bits of sponge and squeezing out the fluid (bits of rubber tubing are more convenient). In the morning the sediment may equal one-fifth the column of fluid. There is a marked difference in the growth of the papillæ at different periods of life, with great individual differences at all ages. In old age the atrophy of the papillæ gives the tongue a glistening appearance, as if varnished. The author thinks there is a parallel between the development of the papillæ and of other epidermoid tissues, as of the skin. He denies a

relation between coated tongue and local diseases of the mouth and throat, except when the former are so severe as to interfere with swallowing. As regards disease, he found a coated tongue by far most frequently in cases of acute disease, whether primarily affecting the digestive tract or not. It is less frequent in chronic digestive diseases, and in chronic gastritis does not occur to so great a degree as in healthy people in middle life. The microscopical examination of the coating shows usually a more rich and diverse material than in health, but in general no essential differences exist. The leucocytes appear to be numerous in cancer of the stomach and tuberculosis. The claim of Bernabei, that specific bacteria can be cultivated in certain diseases from the coating on the tongue, the author thinks worth further investigation. The disappearance of a coating of acute origin is a good sign, because it indicates, usually, that food is properly taken. In chronic diseases the disappearance may have another meaning. The best way of keeping down the coating is by chewing hard food, especially bread. For abnormal coating the use of a soft toothbrush is best.—*Münchener med. Wochenschrift*, 1900, No. 33.

The Pathogenesis of Jaundice.—Browicz (*Wiener klin. Wochenschrift*, 1900, No. 35) has brought together the results of investigations on the causation of jaundice, which, if confirmed, will add clearness to our knowledge of that process. His conclusions are: 1. The origin of jaundice rests on the increased function of normal liver cells, which, irritated by various causes, can take up and elaborate excessive quantities of nutrient and functionating material, eventually hæmoglobin, converting these into bile or bile-coloring matter. 2. Only a normal, healthy liver cell that can take up an excess of material and convert it into bile can empty the extra bile into the intercellular biliary canals. From there, partly through cells of the blood-capillaries, the bile reaches the blood. 3. Mechanical factors have only a moderate effect on the origin of jaundice by setting up disturbances of the circulation within the blood-capillaries. 4. The blood capillaries of the acini furnish the usual route to the general circulation, the lymphatic vessels in the vicinity of the larger biliary canals being concerned only to a slight degree. 5. All forms of jaundice can be explained by the method stated—*i. e.*, the increased function of the liver cells.

Hyperglobuly, Splenomegaly, and Splenectomy.—Cominotti (*Wiener klin. Wochenschrift*, 1900, No. 39) records two interesting cases that, as he says, rather add to the obscurity surrounding splenic pathology, but at the same time raise a number of questions. One case was that of a woman, aged thirty-three years, without a history of definite disease in early life, but always pale and weak. Menstruation began at twenty-two. At twenty-five the menses ceased, and there was severe pain in the splenic region, so that the patient was sick in bed a month. After one year menstruation returned, but was irregular, and a year and a half before admission it stopped entirely. The pain in the splenic region was often increased by defecation, by long walks, and stair-climbing. There was a history of slight epistaxis every month from the eighteenth year. Dizziness, headache, and congestion were frequent, as was diarrhœa, and at one time there was polyphagia and

polydipsia. When admitted there was scoliosis with compensatory changes in the thorax, traces of rickets, emaciation, and slight cyanosis with a brownish discoloration of the skin. The submaxillary glands were somewhat enlarged. The spleen filled the whole left half of the abdomen; it was painful and hardly movable. The liver was slightly enlarged. The blood showed pale red corpuscles with slight tendency to roll formation, the cells varying in size. The count was 7,200,000 red cells, 6000 leucocytes, Gowers' 80 per cent. The spleen was removed and found to weigh four and a quarter kilogrammes. No microscopical examination was made. The patient died of sepsis on the fifty-second day. There was no leucocytosis until the preagonal stage. Autopsy merely confirmed the diagnosis of sepsis.

The other patient was a woman, aged thirty-four years, whose spleen was removed in 1891 for malarial enlargement. There was a recurrence of the intermittent fever in four months, which stopped after treatment by quinine. There was amenorrhœa for two years, after that menstruation was regular, without pain, lasting two or three days. Cessation for six months was to be attributed to pregnancy, and to the same cause were ascribed certain dyspeptic symptoms. There was neither vomiting nor constipation. The red corpuscles were pale, the size and shape almost normal. The small mononuclear leucocytes were increased to 47 per cent., the eosinophiles to 10 per cent. There were 5,500,000 red corpuscles and 7500 leucocytes per c.mm., Gowers' 60.

Beside a brief mention of hyperglobuly in various conditions without splenic disease, the author cites the case of Vaquez, with splenomegaly, cyanosis, and hyperglobuly; that of Vidal, with a remarkable tuberculous disease of the spleen of eight years' duration, associated with increase of the red corpuscles, and those of Montard-Martin and Achard. Such cases emphasize the importance of blood examinations in all cases of enlarged spleen.

Primary Sarcoma of the Stomach.—MINTZ (*Berliner klin. Wochenschrift*, 1900, No. 32) reports a case of this kind, which, with those he has found in the literature and others overlooked by him but given in the report of Dock (*Journal of the American Medical Association*, July 21, 1900), raises the total to about fifty-five, including some not fully recorded. Mintz' patient was a man, aged thirty years, who for one month had complained of eructations, pyrosis, tugging pains in the abdomen, and increasing weakness. Vomiting was rare and the vomitus without striking appearances. For a week before admission the symptoms were severe. Appetite was retained, but the patient avoided food on account of pain. There was rapid loss of weight. For some weeks the left testis had been enlarging. The patient was cachectic and jaundiced. There was a diffuse, firm tumor in the epigastrium, reaching almost to the navel, with a horizontal, movable, cord-like mass passing to the left. Lavage brought up abundant decomposed food-remains, with blood at the last. Hydrochloric acid was absent, lactic present in large amount, with Oppler-Boas bacilli and no sarcinæ. The diagnosis was carcinoma of the pylorus with metastasis in the testis. An operation for gastroenterostomy showed that the tumor occupied the right half of the stomach. Death resulted in four days. Autopsy revealed adhesions between the pylorus and the liver; in the pyloric region a hard tumor the size of a

fist, spreading out toward the fundus in a diffuse manner. The mucosa in the pylorus was the seat of an ulcer 2 cm. wide, occupying almost all of the circumference. The lymph glands in the lesser curvature were much enlarged, as also those in the hepatoduodenal ligament. With the exception of the testis, there were no other metastases. The growth proved to be a lymphosarcoma. The author gives a résumé of the clinical features of sarcoma of the stomach, and thinks it should be considered more frequently in the diagnosis of gastric tumors.

The Etiology of Yellow Fever—A Preliminary Note.—Reed, Carroll, Agramonte, and Lazear (*The Philadelphia Medical Journal*, October 27, 1900, p. 79), who were appointed a commission by the United States Government to study the acute infectious diseases prevalent in the Island of Cuba, give in a preliminary report the result of their observations on the etiology of yellow fever, of which they made a special study.

The first part of their work was devoted to an investigation into the relationship of the bacillus icteroides (Sanarelli) to yellow fever.

From this part of their work they draw the following conclusions:

1. The blood taken during life from the general venous circulation, on various days of the disease, in 18 cases of yellow fever successively studied, has given negative results as regards the presence of B. icteroides.

2. Cultures taken from the blood and organs of 11 yellow fever cadavers have also proved negative as regards the presence of this bacillus.

3. Bacillus icteroides (Sanarelli) stands in no causative relation to yellow fever, but, when present, should be considered as a secondary invader in this disease.

These observers were much attracted by the theory of Carlos J. Finlay, of Havana, advanced in 1881, that yellow fever was propagated by the mosquito. The researches of Ross and the Italian observers on the part the mosquito plays in the propagation of malaria encouraged the belief that the mosquito was also probably the intermediate host of the germ of yellow fever. They carried out a series of experiments in which they allowed non-immune individuals to be bitten by mosquitoes that had previously fed on yellow fever patients. The mosquito used in all cases was Culex fasciatus Fabr. Eleven subjects allowed infected mosquitoes to bite them. Of these only two developed yellow fever. The negative results in the other nine cases are in large part attributed to the fact that the mosquitoes were fed on patients with very mild forms of the disease; also in part to the fact that the mosquito was allowed to bite the non-immune individual too early after it had bitten the yellow fever patient. In the two positive cases intervals of at least twelve and sixteen days had elapsed. The possibility of infection in any other way was practically excluded in these two cases. In a third case, Dr. Lazear, one of the members of the commission, while in a yellow fever ward, allowed a mosquito that had lit on his hand to bite him and to satisfy its hunger. Five days later he began to feel ill, and subsequently developed a typical attack of yellow fever which unfortunately proved fatal. While the possibility of infection from another source could not be excluded in this case, the writers are inclined to the view that the mosquito bite was the probable cause.

From the second part of their investigation the commission felt justified in drawing the following conclusion:

The mosquito serves as the intermediate host for the parasite of yellow fever, and it is highly probable that the disease is propagated only through the bite of this insect.

[Two comments may be made on this most important paper: First, the unwarrantable character of the experiments on human beings—unless (which is not stated) with the full consent and full knowledge of the subjects; secondly, the altogether too positive conclusion from such scanty data as to the part played by the mosquito.—W. O.]

Optic Neuritis in Chlorosis; Death with Symptoms of Brain Tumor.—ENGELHARDT (*Münchener med. Wochenschrift*, 1900, No. 36) reports the following rare and instructive case: A girl, aged eighteen years, with good family history and previous health, became anæmic at the onset of puberty, five years before admission. She tired easily, menstruation was irregular, and pain in the back of the head was so severe as at times to make work impossible. This continued with remissions until October, 1896, when the patient had to give up work. Toward the end of the year vision became poor, headache was almost unbearable, and in a few weeks blindness was complete. There was choked-disk, with œdema and exudation in the retina. A diagnosis of brain-tumor was made, and mercury used by inunction, but without effect. At that time there was no vertigo, no vomiting; the mind was clear; syphilis could be excluded. Admitted to the medical clinic, the patient could distinguish light and darkness; the bulbs were freely movable; pupils wide, not reacting to light or convergence. There was lack of definition of the optic papillæ, the disks grayish-white and cloudy, surrounded by hemorrhages and radiating, glistening white spots and streaks. The sense of smell was lost. The right arm was weaker than the left, the right fingers paræsthetic; co-ordination was good; there was no Romberg symptom; the knee-jerk weak in the left side, absent on the right. The blood showed 3,000,000 red corpuscles per c.mm., leucocytes not increased, Fleischl 50 per cent. A diagnosis of brain-tumor was again made, inunctions again used, without any effect on the blindness. For three weeks there was anorexia, with great emaciation. Soon nystagmus appeared, the right arm grew weaker. The knee-jerk reappeared on the right side, and became exaggerated on the left, with ankle-clonus on both sides. Headache returned, without tenderness on percussion of the skull, but subsided again. In July, 1897, epileptic attacks began, coming on with a cry, followed by loss of consciousness and general convulsions, without biting the tongue. Soon after deviation of the head and eyes to the right was observed, and at times divergent strabismus. The right facial nerve was paretic, the right arm weak, the right side of the body anæsthetic. Swallowing was difficult; the temperature-sense lost, sense of pain weak and slow. The convulsions were not Jacksonian in type. Lumbar puncture, repeated four times, was negative. After a period of partial improvement the mind became weaker and convulsions began again, and with the convulsions, at four different times, there were severe attacks of herpes of the lips, once on the nose. With another return of the headache the general condition became worse, the right

leg was paralyzed. The optic nerves were then completely atrophied, motion in the bulbs good. In March, 1898, death occurred after a period of great restlessness, in which the paralyzed extremities were moved as freely as the others. The clinical diagnosis was tumor in the left hemisphere, behind the central convolutions, in the ocular fibres of Gratiolet or the posterior part of the internal capsule, explaining the anosmia and deviation by irritation. Autopsy showed nothing but general anæmia, with anæmia and dryness of the brain.

The author quotes part of the literature of optic neuritis in chlorosis, the only apparent cause in the present case, but without finding a satisfactory explanation of the pathology. Severe congestion, inflammation and atrophy seem to be the steps in the course of the lesion. The numerous other symptoms that during life led to the diagnosis of tumor can be as readily explained by a neurosis, such as hysteria.

[With the other diagnosis no effort was made to treat the chlorosis, so that the possibility of a different outcome must be a matter of conjecture. The rule in therapeutics, to treat the patient and not the disease, might have been followed with advantage, even if the blindness was inevitable.—G. D.]

Queirolo's Method for Determining the Stomach Boundaries.—EDEL and VOLHARD (*Deutsche med. Wochenschrift*, 1900, No. 35) have tested this method, and find that while in general it is not superior to simple distention with CO_2, yet in some cases it gives useful information. The method consists in passing into the stomach a double tube, opening into a rubber bag at the lower end and connected at the outer end by one tube with a Marey's drum, by another with a stop-cock. After filling the bag in the stomach, the abdomen is lightly percussed. According to Queirolo, the needle moves on the drum only when the stomach is percussed. Queirolo did not make comparative tests. The authors compared the results with those obtained by percussing the stomach distended by CO_2 after marking on the abdomen the outline obtained by the other method. They found a striking agreement, not only over the lower boundary, but also at the fundus. In the liver region there was no advantage in the new method, both being unsatisfactory. [Palpation, at least in some cases, would have been valuable in outlining the lesser curvature, but is not mentioned by the authors.—G. D.] In some cases simple distention gave a lower boundary. Percussion in any part of the abdomen causes movement of the needle. This is especially the case in the navel region, but practice usually enables one to distinguish such motion from the vigorous movements produced when the stomach itself is percussed. Pain or anything causing tension of the abdominal wall lessens the movement. If the stomach is entirely empty when the method is used the results are unsatisfactory. This was shown by a case of pancreatic cyst compressing the pylorus. At first only the fundus was distended by the bag, but after distention with CO_2 the bag showed a stomach outline corresponding with that indicated by the gas. In a case of pyloric insufficiency, in which the CO_2 always passed rapidly into the duodenum, Queirolo's method was very effective in showing the actual shape and position of the stomach, as proved by operation. The authors believe that in case of new-growth the method is not as trustworthy as simple distention, but in cases of suspected abnormal

distensibility they think it may be of some value. They question the explanation of the transmitted wave advanced by Queirolo, viz., that it is due to the air in the bag being under tension, on the ground that they were unable to get good results when the stomach was previously empty, and hold that the general compression of the bag is the cause of the marked movement, less tension being necessary than if one percussed over a distended stomach communicating with a recorder.

SURGERY.

UNDER THE CHARGE OF

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Spinal Anæsthesia. A Review of the More Recent Literature.—The credit for the discovery of this method of anæsthesia belongs to LEONARD CORNING, of New York, who published the results of his experiments in the *New York Medical Journal*, 1885, vol. xlii., p. 483. He used a solution of cocaine, and his first injection was made between the twelfth dorsal and the first lumbar vertebræ, with complete success. Like MITCHELL (*Injuries of Nerves, and Their Consequences*, Philadelphia, 1872) and THORBURN ("Injuries of the Cauda Equina," *Brain*, vol. x.), he regarded the wounding of the terminal filaments or the nerves of the cauda equina as something to be avoided, and so the injection was made between the membranes and not into the subarachnoid space. Despite Corning's success, this method did not seem to meet with the approval of the profession, for no one else attempted it at this time. Six years later QUINCKE (*Berlin. klin. Wochenschrift*, 1891, No. 38) showed that the cerebro-spinal fluid could be evacuated after lumbar puncture with ease and without danger. His experiments were made in order to decrease the pressure caused by the cerebro-spinal fluid, to obtain some of this fluid for examination and diagnostic purposes in certain conditions, and for the purpose of testing the direct action upon the nerves and cord of certain medicines which could be mixed with this fluid. After that MOSSO and FRANCK (*Archives de Physiologie*, 1892, p. 562) showed that the injection of cocaine was followed in six or seven minutes by a complete anæsthesia, which gradually disappeared and was not followed by deleterious effects. SICARD ("Essais d'injections microbiennes, toxiques et thérapeutiques, par voie céphalo rachidienne," *Société de Biologie*, April 30, 1898) injected through a lumbar puncture into the subarachnoid space, in a case of tetanus, 4 c.c. of

antitetanus serum. BIER (*Deutsche Zeitschrift für Chirurgie*, 1899, vol. li., p. 361) applied all of this to surgery in April, 1899, when he made a lumbar puncture, withdrew some of the cerebro-spinal fluid, and then injected a solution of cocaine into the subarachnoid space, and so obtained surgical anæsthesia. He performed six operations in succession by this method, employing a solution varying from 1 : 100 to 1 : 200 in strength, first securing anæsthesia of the skin after Schleich's method. The operations were painless, but the persistence of headache and the condition of malaise caused by the injections induced him temporarily to abandon this method. At this time TUFFIER (*La Presse Médicale*, November 15, 1899) began using this method, using a 1 per cent. solution of cocaine, which caused perfect anæsthesia, but was followed by severe headache. About the same time SELDOWITCH (*Centralblatt für Chirurgie*, 1899, No. 41, p. 1110) reported his experience with this method, and since then many names have been added to the bibliography.

CORNING (*Medical Record*, New York, October 20, 1900) thus describes the technique: The needle may be from three and a half to four inches in length and, preferably, made of either platinum or gold, which will bend, but is not liable to break. There should be a small steel nut transfixed by the needle, sliding freely upon it and fixable at any point in the needle's length by the aid of a small set-screw. When the needle is thrust in and a few drops of cerebro-spinal fluid emerge, this nut is slid down until its lower aspect rests on the skin, when it is firmly fixed in place by tightening the screw, and so effectually prevents the further entrance of the needle into the spinal canal. The syringe should be of glass, graduated up to thirty minims or more, and provided with an asbestos packing, which permits of more thorough sterilization. A short, delicate trocar should be used to penetrate the skin of the back, subsequently passing the needle through the opening of the trocar. The operator should prepare his hands as for any major operation, and the patient's back should also be prepared in the usual manner. The syringe, needle, and trocar should be carefully sterilized as well as the anæsthetic, which should be a 2 per cent. solution of the hydrochlorate of cocaine, but SEGUEN and KENDIRDJY (*La Presse Médicale*, October 27, 1900) report having had equally good results with a hydrochlorate of eucaine solution. At present there seems to be a predilection in favor of making the injection between the spinous processes of the fourth and fifth lumbar vertebræ, although anæsthesia is more quickly induced when the injection is made higher up. After puncturing the skin with a trocar the needle should be slowly introduced through the trocar in a direction from without inward and from below upward. The outflow of a few drops of cerebro-spinal fluid will tell of the penetration of the membranes. The needle may now be attached and injection made of from 10 to 15 minims of a 2 per cent. cocaine solution. The needle should be maintained in place until anæsthesia appears. The phenomena following the injections are paræsthesia, tingling, numbness, and finally disappearance of sensibility to pain in the regions below the point of injection. The time that elapses before anæsthesia is complete is variable, but, as a rule, it is from four to ten minutes, and the duration of the anæsthesia is from an hour to an hour and a half. This method of anæsthesia has been used in a large number of cases, and so

far without a single death due to the anæsthetic. Seguen and Kendirdjy (*supra cit.*) report their results in fifty-seven cases, in all but two of which the anæsthesia was perfect. The first of the two unsuccessful cases was a woman with appendicitis, and the second was a case of bilateral salpingitis, necessitating vaginal hysterectomy. In three other cases vaginal hysterectomy was performed under perfect anæsthesia. TUFFIER (*La Presse Médicale*, November 7, 1900) reports 210 successful cases, 112 of which were intraperitoneal operations. Many others have added to the bibliography of this method; thus KREIS (*Centralblatt für Gynakologie*, July, 1900), DOLERIS ("Anesthesie Obstetricale par injection de cocaïne sous l'arachnoïde lombarie," *Académie de Médecine*, July 17, 1900), and MARX (*New York Medical News*, August 25, 1900) have applied this method to obstetrics. TUFFIER ("De l'anesthésie médullaire par injection de cocaïne sous l'arachnoïde lombaire," *XIII. Congrès Internat. de Médecine*, Paris, 1900) gives a most thorough review of his experience to date. SEVEREAUN and GEROTA ("L'analgésie chirurgicale par les injections de cocaïne dans le canal rachidien," *XIII. Congrès Internat. de Médecine*, Paris, 1900), NICOLETTI ("Recherches expérimentales, histo-pathologiques et cliniques sue l'anesthésie cocainique de le moelle épinière par injection sous arachnoïdienne lombaire," *XIII. Congrès Internat. de Médecine*, Paris, 1900), PITESCI ("Anesthesia par injection de cocaïne dans le canal médullaire," *XIII. Congrès Internat. de Médecine*, Paris, 1900), and RACORICEANU (*Contributiom à l'Étude de l'Anesthésie Médullaire par le Cocaïne*, Paris, 1900) report cases, and state their belief that the nerves return to the normal and remain so after the injections. BIER (*Münchener med. Wochenschrift*, September 4, 1900), after an experimental and clinical study, insists, with reason, upon the dangers of using large doses of the anæsthetic. More recently POUSSON and CHAVAUNAZ (*Journal de Méd. de Bordeaux*, 1900, vol. xxx.), JONNESCO (*Bull. et Mem. de la Soc. de Chir. de Bucarest*, 1900, vol. ii.), DUMONT (*Correspondenzblatt f. Schweizer Aertze*, 1900, No. 13), BIBOT (*Un Nouveau Procédé d'Anesthésie Chirurgicale*, Paris, 1900), DE RONVILLE (*Nouveau Montpellier Medicale*, 1900), TUFFIER and HALLION (*Société de Biologie*, November 4, 1900), MOORE and STEWART (*Northwestern Lancet*, November 1, 1900), and TAYLOR (*Virginia Medical Semi-Monthly*, October 26, 1900) have reported cases. As a rule, the phenomena following the subarachnoid injection of cocaine are vomiting, headache, and some elevation of temperature. SEGUEN and KENDIRDJY (*supra cit.*) state that in 31 of their 55 cases vomiting was entirely absent. Thirteen of the patients did not vomit during the operation, but did so in from a few minutes to an hour after the completion of the operation. In 11 cases the vomiting came on during the operation, but ceased before it was finished, and did not recur afterward. Headache was a little more frequent, being present in 31 cases. As a rule, it was not severe and lasted until the following morning, and probably helped to produce the insomnia, which often follows this method of anæsthesia. However, in two cases it was very acute, and in another case (that of a woman who had been curetted) it presented the characteristics of a true morcellement during the following thirty-six hours. An elevation of temperature was observed after the operation in 12 of the 55 cases; in one case (that of an abscess following extravasation of urine) it could not be attributable to the injection, but was the result of the patient's

condition. The other cases comprised: 6 radical cures for inguinal hernia, 2 cases of tubercular epididymitis, 1 case of varicocele, 1 case of fistula in ano, and 2 cases of curettement. The temperature in these cases varied between 38° and 40° C., and by the following morning it came down to normal, and remained there. The night after the operation is often a restless one, often the result of the elevation of temperature and the headache, for when both of these sequelæ were absent the patients slept well. Dilatation of the pupil was observed in a certain number of cases, generally as a phenomenon premonitory of vomiting and headache, and was the result of a more rapid or greater action of the cocaine. In seven cases relaxation of the sphincter ani was observed; in one case it occurred during the operation. Paraplegia has been feared by some authors as a sequela, but in only one case was it observed —that of a woman who was curetted and who had slight paralysis of the legs for three hours, when it disappeared. Some vesical troubles have followed this method of anæsthesia. One case operated on for hydrocele had retention of urine for eight days, and the symptom then disappeared. In another case, that of a woman who was curetted for metritis, incontinence suddenly developed without being preceded by retention, and lasted for three days.

Seguen and Kendirdjy (*loc. cit.*) state that this method of producing anæsthesia has its advantages and its disadvantages. Among the former are that it may be used in those patients who are afraid to take chloroform and who desire to be operated upon without suffering and without loss of consciousness; but it is also to be remembered that for certain operations this may be a great inconvenience, such as in the major pelvic and abdominal operations, in which this method of anæsthesia is distinctly contraindicated. It is especially contraindicated in the major gynecological operations, for with this method muscular relaxation cannot be obtained; vomiting may come on during the operation, and these distinctly increase the operative risk in a delicate operation. But aside from these restrictions the lumbar anæsthesia is superior to the general anæsthesia; during the operation the anæsthesia is absolute; after the operation the patient is returned to his bed in a calm frame of mind. He may eat before and after the operation, and there is not the sequela of almost constant vomiting which nearly always follows the use of a general anæsthetic. Again, nothing is more in favor of the use of the lumbar anæsthesia than the rapidity with which it is agreed to; and the patient is returned to his room conscious and tranquil. Patients who have submitted to general anæsthesia and also to the lumbar method cannot speak too highly of the latter. On the other hand, spinal anæsthesia is not destined to replace chloroform, but it does constitute an excellent method for a certain class of cases. General anæsthesia is still indicated in the major gynecological and pelvic operation, preferably in vaginal hysterectomy, in exploratory laparotomies, and in all operations in which muscular relaxation is essential to operative success; but, on the contrary, the spinal anæsthesia is to be preferred in all operations below the umbilicus which are short in duration and simple of execution, such as operations on the perineum, the external genitalia, and the legs in cases where muscular relaxation is not a factor in operative success. In conclusion, it may be said that although no deaths have so far been reported from this method, it still remains to be shown that subarachnoid cocainization is safer than general

anæsthesia; in fact, it is very questionable if it is as safe. The puncture of the spinal canal itself, not to mention the injection of cocaine, is not without its danger, as has been shown by GUMPRECHT (*Deutsche med. Wochenschrift*, 1900, vol. xxvi., p. 386), who reports seventeen cases of sudden death following simple lumbar puncture for diagnostic purposes. Beside this the involuntary defecation and urination during the operation is not only embarrassing, but in addition may add greatly to the operative risk by infecting the field of operation. Again, it would seem to be a marked disadvantage instead of an advantage to have the patient conscious during the operation.

As Corning (*supra cit.*) has stated, everyone at all conversant with the serious results inevitably following infection of a serous cavity must be profoundly impressed with the necessity of a rigid asepsis, and any neglect of those necessary and elaborate rules of antisepsis so necessary to the safety of the patient will be followed by most disastrous results. He clearly emphasizes the dangers to the cord from this operation, and it would seem that sufficient time has not yet elapsed to prove absolutely that this method of anæsthesia will not be followed by degeneration of the cord and of the nerves.

Observations on the Surgery of the Gall Tracts.—JONES (*Medical Record*, October 20, 1900) states that patients with long-standing disease of the gall tracts are poor subjects for surgical operation, and surgical interference is attended by considerable risk. In such cases it would seem to be best to do first a cholecystostomy—the simplest operation and the one attended by the least risk—leaving more radical treatment for another time should it become necessary. He emphasizes: (1) The diagnostic value of the point of maximum tenderness on pressure, which is over the gall-bladder, at or near the costal margin of the ninth rib. This point in disease of the gall tracts corresponds in importance with McBurney's point in disease of the appendix. (2) The diagnostic value of the presence of bile in the urine excreted during or immediately after a very brief obstruction of the common duct. (3) That disease of the gall tracts is of very common occurrence, and is liable to be mistaken for other troubles which it closely imitates, so it is important that the cases be recognized early.

Clinical Notes on Cases of Gallstones.—CHAPMAN (*Intercolonial Medical Journal of Australasia*, September 20, 1900) reports three cases. The first case was a woman who presented symptoms of pain in the region between the ensiform cartilage and the umbilicus, vomiting after severe attacks of pain and on taking solid food, some jaundice, and some fever. A small, rounded, movable tumor could be felt above the umbilicus just to the right of the median line. Palpation of this tumor caused severe pain. An exploratory operation was performed, and on exposing the tumor it was found to be the gall-bladder, slightly enlarged and containing a stone, which was removed. The gall-bladder was sutured to the peritoneum and drained. The patient made an uninterrupted recovery. The second case was that of a woman who complained of indigestion, occasional attacks of vomiting, jaundice, loss of appetite, and pain on the right side in the epigastric region,

but no tenderness. On palpation a swelling was found in the median line and slightly to the right, transmitting the aortic impulse and apparently superior to the pylorus. There was an irregular temperature, with night-sweats and chills. As the patient was becoming steadily weaker, operation was decided upon, and an incision was made in the median line above the umbilicus. A stone was found in the common duct; it was freely movable, but it was found impossible to move it into the gall-bladder even after incising the gall-bladder, so the stone was removed after incising the common duct. The incision in the gall-bladder and in the duct were closed by sutures, and the patient speedily recovered. The third case presented all the characteristic symptoms of empyema of the gall-bladder. The abscess was opened and a half-pint of pus and a small calculus were removed. The wound was closed with drainage, and on the fourteenth day after the operation the patient left the hospital with the wound healed, and has remained well.

The Technique of Exploratory Craniotomy.—CODIVILLA (*Revue de Chirurgie*, November 10, 1900) states that the craniotome which he has devised is so constructed that one is able to elevate large pieces of the cranium in either an oval or a circular form. It divides the soft parts concentrically to the incision of the bone, but through a larger circumference than that which is marked on the cranium by the osteotome. The incision made on the bone is nearly linear, and the loss of bony substance is slight. The craniotome may be applied equally well to the hard part of the cranium and to the soft, weak parts. Repair reproduces in the region operated upon the normal anatomical conditions. The craniotome may be operated rapidly and surely and without danger of wounding the skull contents. The instrument is capable of easy transportation and sterilization. It requires no other force than the hand of the surgeon.

The Surgery of the Stomach.—CARLESS (*The Practitioner*, London, November, 1900) states, after reviewing the various operations that may be performed on the stomach, that there are quite a number of conditions in which gastro-enterostomy is undertaken simply for the purpose of assisting the stomach to empty itself as rapidly as possible. Thus it may be advisedly recommended under the following circumstances: (1) When a patient with gastric ulcer has been carefully dieted and given every chance to recover, and yet the symptoms persist. (2) It may be utilized in the treatment of hemorrhage, in connection with gastric ulcer, which occurs either as an acute or as a chronic complication. (3) It is probably the best operation in all cases of pyloric stenosis due to gastric ulcer, and possibly the only feasible proceeding when stenosis of that orifice arises from extrinsic causes, such as the contraction of adhesions formed in connection with an inflamed gall-bladder. (4) In pyloric cancer the same limitations are frequently present. The growth early contracts adhesions to surrounding parts, whereby it is rendered hopelessly irremovable, and care must then be taken that the anastomosis is performed through a portion of the gastric wall which is sufficiently healthy. (5) Again, there are not a few cases of atonic dilatation of the stomach which are best treated by gastro-enterostomy, though not until a thorough course

of lavage and medicinal treatment has been undertaken. (6) Once more, in the condition known as hyperchlorhydria or gastric succorrhœa, in which the patient is tormented with acid eructations and heartburn, to say nothing of pain and distention, the rapid emptying of the viscus is most desirable, and in no way can this be better accomplished than by the formation of an artificial opening into the jejunum.

PEDIATRICS.

UNDER THE CHARGE OF

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AND

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The Confusion of Two Diseases under the Name of Rubella.—CLEMENT DUKES (*Lancet*, July 14, 1900, p.89) presents what seems to be conclusive proof that the eruptive disease described under the name of rubella, which has been recognized under two distinct forms—the morbilliform and the scarlatiniform—is really not one, but two different diseases, the one resembling scarlatina so closely being designated by him for the present "the fourth disease," measles, scarlatina, and morbilliform rubella constituting the other three.

He refers to a school epidemic of thirty-one cases of an illness (assumed to be the scarlatiniform variety of rubella, but really the "fourth disease") which proved to be scarlet fever and the "fourth disease" simultaneously occurring, thus showing the entity of this "fourth disease" as a distinct and definite malady, separable from scarlet fever and even from a modified scarlet fever. In this epidemic some of the patients (32.25 per cent.) apparently passed through the same illness twice over. Mainly guided by the period of incubation, the author was able to decide that some of the boys had scarlet fever only; that others had the "fourth disease" only; that one had scarlet fever and subsequently the "fourth disease," and that others had the "fourth disease," followed by scarlet fever.

In another school epidemic of nineteen cases at Rugby the illness resembled scarlet fever more closely than any series of cases hitherto seen by the author, due not only to the marvellous resemblance between the rash and that of scarlet fever, but also to the copious desquamation of the skin which in some instances succeeded. It was clearly, however, an epidemic of the "fourth disease" alone. In this series 42.1 per cent. had already suffered from rose-rash (some within the preceding twelve months).

The symptomatology of the "fourth disease" apparently coincides very closely with that of the ordinary type of rubella, except in the different

appearance of the rash and in the fact that desquamation may be very complete and as free as in the worst cases of scarlet fever. The rash differs from that of rubella in that it does not pass through a stage of morbilliform maculation, but assumes the character of scarlatina from the beginning. Redness and swelling of the fauces are usually present, but are attended with but little discomfort. The cervical lymph glands are somewhat enlarged and tender, but while more pronounced than in scarlatina this enlargement is usually less conspicuous than in rubella. The fact that the disease, as noted in the Rugby epidemic, affects patients that have previously suffered from undoubted rubella is the most convincing point of all.

The points which serve to distinguish the "fourth disease" from scarlatina are its prolonged incubation, nine to twenty-one days; the usual lack of pre-eruptive vomiting; the low pulse rate, which rarely reaches 100; absence of desquamation of the tongue about the fourth day, and thus failure to observe the strawberry tongue; the absence of renal complication; the lack of immunity against a subsequent attack of scarlatina, and the shorter period of infectivity, which is said to be limited to from fourteen to twenty-one days, even though the desquamation may continue for several weeks longer.

[The assertion of so distinguished an observer as Dr. Dukes, that there are good grounds for assuming the existence of a "fourth disease," is worthy of very respectful attention. That there is a disease so closely resembling scarlet fever as to have been frequently mistaken for it there can be no doubt in the mind of any careful student of the eruptive diseases of childhood. Whether this is generically distinct from the ordinary type of German measles is a question that should not be hastily answered, though the statement that fully 42 per cent. of a series of patients suffering from this disease had previously passed through an undoubted attack of rubella is a most suggestive one. The problem opens up a new field for investigation on the part of observers in institutions in which a large number of children may be carefully studied under similar conditions.—ED.]

Splenic Anæmia of the Infant.—WEST (*Medical Press*, August 22, 1900, p. 184), in a short review of the splenic enlargements of children, deals especially with the condition unsatisfactorily described under the name of splenic anæmia. This is an unfortunate term, first, in that it seems to imply or assume what really is not yet proven, that the anæmia in some way depends upon and is caused by the affection of the spleen, and, secondly, because the same term is applied to another entirely clinically different affection affecting adults chiefly and only very rarely children, and, as far as the author knows, not recorded in very young children and infants. The disease under consideration, on the other hand, is not an uncommon one, to which infants are especially liable, though it may continue from infancy through the first two or three years of life.

As seen in infancy, the nature of the case is often clearly indicated by the peculiar anæmia and the enlargement of the abdomen. The complexion has a peculiar waxy, ivory-like color with a tinge of olive-green in it, which is very characteristic. The abdomen is tumid and the enlargement of the spleen is often obvious to the eye. The child is usually not emaciated, and

may be plump, but is very feeble. The blood shows no changes but those of simple anæmia, and there is little or no enlargement of the lymphatic glands. The splenic enlargement is easily recognized; it may be enormous, so that the organ may extend forward beyond the umbilicus, and downward as far as the anterior superior iliac spine. It moves freely on respiration, is smooth on the surface, and is not tender to palpation.

The cells are greatly reduced in number, but retain their relative proportion to each other. The number of red cells may fall as low as 40 per cent. of the normal; if below this figure the result is almost invariably fatal. The red cells retain their normal amount of hæmoglobin, though some maintain that this is reduced as in chlorosis. Nucleated red cells and megalocytes are often present in small numbers, but the eosinophiles do not vary. If there is any increase in the number of white cells it affects only the lymphocytes, and this stands in direct relation, it appears, with the fever.

The facts that bear on the relation of the splenic enlargement to syphilis and rickets are summed up as follows: Syphilis is occasionally, and rickets frequently, associated with splenic anæmia, but in neither case is the association constant. Neither of them is the sole cause, and they are probably not causes at all, except perhaps, indirectly, by means of the ill-health to which either leads.

As to the relation between the anæmia and the splenic enlargement, three possible alternatives are suggested: 1. The enlarged spleen may be the cause of the anæmia. 2. The anæmia may be the cause of the enlarged spleen. 3. Both the anæmia and the splenic enlargement may be joint results of some common cause. To the first two there are very strong objections. Hence, if neither be correct, it would seem to follow that the third explanation must be the true one, that both conditions depend upon some common cause. It may be, as is held by some, that any condition of health serious enough to lead to profound anæmia in infancy may be associated with splenic enlargement. If this be the case it ought to follow that when health is restored the splenic enlargement should disappear. This, the author thinks, is too sweeping a view of the subject, and concludes that if there be a common cause we do not as yet know what it is.

A Case of Suppression of Urine Apparently Due to Ascaris Lumbricoides.—VANDER BOGERT (*Archives of Pediatrics*, October, 1900, p. 747) reports the case of a girl, aged five years, admitted to the hospital with a history of not having passed urine for nineteen hours. The child had never been healthy, having always had intestinal troubles and difficulty in micturition. Four days before admission she complained of severe pain in the abdomen, which caused her to lie with the thighs flexed. The bowels moved with difficulty, and the abdomen was tender to pressure. Examination upon admission failed to show any abnormal condition except that the temperature was 101.2° F., the pulse 120, and respirations 48. The bladder was apparently empty, but urine was passed soon after admission. The evening temperature continued to be elevated, and on the eighth day reached 103.4° F. At this time the throat was inflamed and, consequently, a dose of antitoxin was given, since cases of diphtheria had been occurring in the ward. After this the temperature gradually fell to normal, and so remained. In the two

weeks following admission the daily amount of urine never exceeded nine ounces, and only twice did it reach that amount. On the fifteenth day the quantity suddenly increased to thirteen ounces, and a round worm, 27 cm. long, was passed by the bowels. From this time the daily amount of urine averaged fifteen ounces, with much lost.

Frequent examinations of the urine always gave negative results, and at no time were symptoms of suppression of urine present. Eggs of the ascaris lumbricoides were found in the stools on one occasion, two days after passage of the worm, and four days later eggs of the tricocephalus dispar were also observed. Treatment with calomel and santonin produced no results.

Researches on the Thymus Gland.—KATZ (*Le Progrès Médical*, June 23, 1900) reports a series of sixty-one observations made at the request of Bourneville at the Hôpital des Enfants Malades, upon mentally sound children dying from various diseases. The age of the subjects varied from one month to thirteen years, forty-one being under two years of age. The gland was present in every case, which is of great interest, since Bourneville's statistics of its presence in imbecile, idiotic, epileptic, and mentally deficient children showed that no trace of its presence could be found in twenty-five of his twenty-eight cases. In the majority of cases the gland was reddish-gray in color, in seven dark red. Thirteen of the cases died of diphtheria, and in every case the thymus weighed more than the usually assigned average weight of 1½ to 4 grammes, in one case reaching a weight of 18 grammes. This increase of weight in cases of diphtheria would seem to be more than coincidental. Indeed, the variability of weight of the gland in the whole series was not in accord with the usual statement of authorities. Thus in 20 cases from one to five months old, the weight was 11 grammes: in 25 cases from five months to two years old, it was 6 grammes; and in 18 cases over two years, it was 8 grammes. Bourneville's further studies on mentally abnormal children have shown the gland to be present in only 27 per cent. of 292 cases. It thus seems evident that the gland disappears earlier in abnormal children than in the normal ones.

Typhoid Fever Without Intestinal Lesions in an Infant.—BRYANT (*British Medical Journal*, 1899, ii. p. 776) reports the youngest instance of this unusual condition so far reported. The patient was a baby one year and nine months old, who was brought into the hospital for a persistent diarrhœa. The child was greatly emaciated, the abdomen distended and hard, the spleen enlarged; there was a focus of bronchopneumonia on the right lung, the pulse was 136, and the temperature moderately high. On the following day the diarrhœa became more aggravated, and vomiting began, withsteady loss of strength, and death on the twenty-second day. A Widal test made on the last day of life gave a strong reaction at the end of two minutes.

At the autopsy foci of recent bronchopneumonia were found in the lungs, but the intestines were absolutely healthy, except for marked swelling and softening of the mesenteric ganglia. Numerous cultures were made from these hypertrophied glands, and bacilli were obtained which gave both the positive and negative reactions of Eberth's bacillus.

The author has collected fifteen observations of typhoid fever without intestinal lesions, the age of the subjects varying from that of his own case—one year and nine months—to sixty years. Eleven of the cases presented the general symptoms of typhoid fever. The bacillus was obtained from the spleen in fourteen cases; from the liver in four cases; from the kidney in three cases; from the lung in three cases; from the mesenteric gland in two cases, and from the heart, biliary passages, and cord in one case. The Widal reaction has given positive results in all of the reported cases.

Treatment of Dysenteriform Entero-colitis in Infants.—ST. PHILIPPE (*Le Bolletin Médical*, June 6, 1900) states that the glairy dysenteriform variety of entero-colitis is favorably modified by fresh guarana powder, obtained after cold maceration. It should be prepared some time in advance of the time at which it is to be used. The dose varies with the patient's age, from 50 cgm. to 2 gm. in twenty-four hours. The physiological action is complex, but it apparently acts in a substitutive and tonic way.

The Etiological Significance of Hereditary Syphilis in Congenital Heart Lesions.—MONCORVO (*Pediatria*, February, 1900) has recorded his observations of cases of congenital heart affections covering a period of sixteen years. He found that in two cases out of three these infants presented more or less distinct signs of hereditary syphilis, with or without other abnormalities of growth or development. With the majority of observers he agrees in considering rheumatism and tuberculosis of less etiological importance than syphilis. Two cases of congenital heart disease are reported in which a syphilitic history in the parents was obtained. He concludes that syphilis is the principal factor in the production of morbus cæruleus.

THERAPEUTICS.

UNDER THE CHARGE OF

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A Chemical Contribution to Silver-therapy.—DR. EMIL LANGE, recognizing the fact that the detection of minute quantities of silver in animal tissues and organs is of importance on account of the ever-increasing use of soluble silver, has carried out some laboratory experiments. He injected into the jugular vein of a rabbit colloidal silver in a solution of egg-albumin, sodium chloride and distilled water to the amount of six and two-tenths

grains of metallic silver. After an interval of nine days the animal was killed, and the only abnormal condition found was a moderately grayish discoloration of the liver, spleen, kidneys, and psoas muscles. The pancreas, skin, small intestine, brain, psoas muscle, skin, liver, heart, lungs, sternum, knee-joint, kidney, stomach, urine, and bile were examined. Chemical analysis, made according to the method detailed, revealed the presence of silver as chloride in the spleen, intestine, heart, lungs, and kidney. Had the treatment been more intensive or prolonged doubtless silver would have been demonstrated to be present in the other organs and tissues.—*Therapeutische Monatshefte*, 1900, No. 8, S. 423.

[These observations settle beyond doubt the innocuousness of soluble silver even given intravenously, and establish the fact of its ready absorption and wide distribution through the organism.—R. W. W.]

The Physiological Action of Senecio Jacobœa.—Dr. J. L. Bunch has made a series of laboratory experiments with groundsel. He concludes that (1) injection of small doses of an alcoholic extract of the entire plant into the circulation of a dog causes a rise of general blood pressure, with constriction of peripheral vessels and of vessels of the intestinal area. This effect is accompanied by a diminution in the magnitude of the contractions of both auricle and ventricle. (2) Large doses cause a corresponding fall of blood pressure, with dilatation of the intestinal vessels and inhibition of the contraction of the intestinal coat. (3) After several injections of small doses, or after one large dose of the alcoholic extract, further injections produce a fall of blood pressure, with slowing of the heart, and this effect is repeated unless a considerable interval is allowed to elapse before any further injection of the drug, which then again causes some rise of blood pressure. (4) The entire plant contains two substances with distinct physiological action, but which have not, as yet, been isolated. (5) Watery extracts of the residue obtained by evaporating the alcoholic solution produce a fall of blood pressure and cardiac inhibition, due to the action of the drug on the nerve terminations in the heart, and not to direct action on the muscular fibres of that organ. (6) The substance which causes the rise of blood pressure is not contained in such watery extracts, or, if present, is so in only small quantities.—*British Medical Journal*, 1900, No. 2065, p. 212.

Amylene-chloral.—Dr. J. Arnold Goldmann states that this substance, otherwise known as dormiol, is a combination of one molecule of chloral with one molecule of amylene hydrate. It occurs as a colorless, oily fluid, of a camphoraceous odor, and of a peculiar, though not unpleasantly pungent, cooling taste. Physiological experiments show that 24 per cent. more chloral was borne in the form of dormiol than when taken as uncombined chloral hydrate. From this it is concluded that the decidedly lesser toxicity of this drug is referable to the gradual occurrence and slow progress of disunion of the preparation. Observations upon twenty-four patients show that it has a prompt and reliable hypnotic action, and also an undeniable sedative effect; that it can be depended upon to manifest its action in relatively small initial doses of six minims; that larger doses, often up to twenty-four or thirty-six minims, employed occasionally in individual cases,

have no pernicious consequences; that compared with other hypnotics it is well borne, and, on account of its slow absorption, more harmless, safer, and of more persistent action; that the desired sleep often sets in within a quarter of an hour without preliminary excitation from the remedy, and continues undiminished for several hours; that it has no cumulative action, and even on long-continued use no tolerance is established; that it agrees well with the patients and is taken without any repugnance; and last, that it has no untoward or harmful by-effects or after-effects.—*Merck's Archives*, 1900, vol. ii., p. 394.

Pyramidon and Antipyrine.—MM. ALBERT ROBIN and G. BARDET, under the heading of an aromatic remedy exciting organic changes, present an interesting comparison of these remedies. Noting the observation of Dujardin-Beaumetz, made in 1889, that amide derivatives present notable antipyretic properties, while the methyl derivatives generally possess marked analgesic action, they believe that these drugs are examples of this law. First, pyramidon increases the proportion of urea to total nitrogen in the urine, while antipyrine diminishes it. In febrile diseases pyramidon regularly increases the coefficient of oxidation in place of diminishing it, and in diabetes it can considerably increase organic changes. For pain this remedy acts well not only in rheumatism but in neuralgias, and for this purpose is superior to antipyrine. In diabetes due to exaggeration of nutritive changes pyramidon can only act unfavorably, increasing the amount of sugar, while the effect of antipyrine is directly the opposite.—*Les Nouveaux Remèdes*, 1900, No. 15, p. 337.

Heroin as an Analgesic.—DRS. SAMUEL HORTON BROWN and ERLE DUNCAN TOMPKINS report on fifty instances of its use—for relief of pain, thirty-four; as a hypnotic, sixteen. In all but seven sleep was produced and pain relieved. The action of the drug began in fifteen minutes from the time of administration in twenty-five; in twenty minutes in eighteen patients. The dose was one-twelfth of a grain of the hydrochlorate in thirty-four, and one-sixth in sixteen cases. In thirty the duration of the action of the drug was four, in thirteen from six to eight hours. Thirty-one administrations were hypodermatic, the remainder by mouth. Vomiting was absent in all but four instances, and as these were made before the patients had fully recovered from the effects of ether, it would be difficult to say which was the cause of the vomiting. Contraction of the pupils and subsequent constipation were absent.—*Therapeutic Gazette*, 1900, No. 8, p. 519.

A New Method of Anæsthesia.—DR. F. C. FLOECKINGER makes use of a 2 per cent. solution of nervanin by the Schleich infiltration method. He presents the following résumé of his experiments: (1) Cocaine has a ten times greater toxic action than nervanin in the same doses. (2) Disturbances of the central nervous system and toxic symptoms did not occur. (3) Nervanin has anti-bacterial properties which are totally absent in cocaine, and which preclude the possibility of infection from the use of nervanin. (4) Analgesia follows more quickly and lasts longer with nervanin than with cocaine. (5) A nervanin habit is an impossibility. (6) The burning sensa-

tion felt after injection is attributable to a too rapid discharge of fluid. (7) The after-pain which always follows the hypodermatic use of cocaine cannot occur with nervanin when properly injected. About half an hour before all large operations a hypodermatic injection of one-eighth or one-fourth of a grain of morphine was made.—*The American Therapist*, 1900, vol. ix. p. 51.

Treatment of Acute Alcoholism by Large Doses of Digitalis.—Dr. Henry P. Loomis has employed half-ounce doses of the tincture given every four hours for three days. If the patient became quiet and the delirium disappeared the remedy was stopped before the third dose. If not, another series of three doses six hours apart was ordered. From observation of ten patients he concludes that the indiscriminate use of such doses is fraught with danger. They should be given only to the robust, those in early life, with no complications, and those with violent delirium. If after three doses no narcotic effect is produced the remedy should be stopped. The failures were in the chronic alcoholic subjects, in middle and advanced life, the anæmic, and in those with bad nutrition.—*Journal of the American Medical Association*, 1900, vol. xxxv. p. 337.

A New Treatment for Sciatica.—Dott. Alexandro Ghette injects hypodermatically salophen dissolved in a sterilized alkaline solution. Two drachms of this solution should contain fifteen grains of the remedy. The injection is made every second day at the middle of a line drawn from the tuberosity of the ischium to the great trochanter.—*Gazzetta degli Ospedali e delle Cliniche*, 1900, No. 114, p. 1195.

Urotropin.—Dr. Zaudy calls attention to the fact that this remedy is not only curative but prophylactic. An instance of complete paraplegia is cited in which bloody pus in large amounts was discharged from the urethra. No gonococci were found. In an effort to make the patient more comfortable he received seven grains in tablets thrice daily for the forty days preceding his death. After eight days the urine became entirely free from pus. The necropsy showed that although the complications were severe there existed but a slight cystitis and no vestige of pyelonephritis.—*Deutsche medicinische Wochenschrift*, 1900, No. 37, S. 589.

Dott. Canali reports that a patient who had suffered for three years from renal colic, whose urine contained albumin, pus, and many small granules of uric acid, received this remedy, and after ten days began to pass small uric acid calculi in the urine. The pains disappeared, and a month later he was cured. This patient apparently suffered from calculous pyelitis. —*Gazzetta degli Ospedali e delle Cliniche*, 1900, No. 99, p. 1040.

The Treatment of Diabetes Insipidus by Amylene Hydrate.—Dr. Wilhelm Niessen reports three instances of the use of this remedy in dose of half a drachm, either at bedtime, or in two doses night and morning. The taste of the remedy is somewhat unpleasant, it often produces burning in the throat, and sometimes eructations. It is best administered in sweetened red wine or a glass of beer.—*Therapeutische Monatshefte*, 1900, Heft 8, S. 422.

[A considerable experience with this remedy indicated that less than a drachm dose was ineffectual, and, further, that patients very rapidly acquire a tolerance for the drug. Its taste soon becomes extremely repugnant to patients.—R. W. W.]

The Treatment of Urethral Blennorrhœa.—Dr. Meyerhardt praises oil of sandal wood, and reports that in thirty-five instances of acute disease cure was reached in from three and one-half to twelve weeks, in some instances longer, two having lasted thirty-three weeks. Sixteen subacute cases were cured in from two and one-half to seven weeks; in three the longest cure took eleven, twelve, and twelve and one-half weeks. Of thirteen chronic cases the necessary time varied from nine and one-half to sixteen weeks; in one it was eighteen, and in one forty weeks.

Dr. F. G. Möhlan has treated about one hundred and twenty patients suffering from chronic gonorrhœa by massage of the penis from prostate to glans, and irrigation of the bladder and urethra with one or two quarts of lukewarm boiled water. A steel sound which just fills the urethra is passed, and massage in the same direction is repeated. After removal of the sound the urethra is again irrigated. This procedure is repeated every two or three days, and in about three weeks no inflammatory products can be demonstrated by the microscope.—*Therapeutische Monatshefte*, 1900, Heft 8, S. 428.

The Medicinal and Dietetic Treatment of Heart Failure in the Aged.—Dr. Forbes Ross presents some facts in the use of strophanthus as illustrated by cases: (1) Failure, without suitable diet. (2) Success in the same case, with suitable diet, after digitalis had failed to relieve. (3) The need for nerve stimulants with the use of this remedy, particularly in cerebral degenerations. (4) The value of a tonic dietary for the purpose of regenerating the nervous forces. (5) The prolonged tolerance for, and relatively harmless effect of, the lengthened administration of this remedy on the cardiac, nervous, and digestive systems. (6) The adjuvant action of other drugs used at the same time, as mercury, nitrates, alkalies, diffusible stimulants, and nerve tonics. (7) Success or failure of strophanthus is governed by the absence or presence, untreated or unprovided for, of conditions outside the range of the therapeutic action of the drug; the latter is often wrongly judged to be ineffective or harmful. (8) The peculiar actions and symptoms, mainly adverse, produced by strophanthus when administered in combination with a mineral acid.—*The Lancet*, 1900, No. 4016, p. 515.

Intensive Guaiacolization in Pulmonary Tuberculosis.—Drs. A. Weill and M. S. Diamantsberger propose the following: (1) Preliminary evacuant injection of a 3 per cent. aqueous solution of boric acid, followed by forty to fifty drops of a solution of equal parts of synthetic crystallized guaiacol and oil of sweet almond in a quarter of a glass of milk. (2) Application of the guaiacol oil solution every day over a space three by four inches on different parts of the chest. (3) A pill every three or four hours constructed as follows: Synthetic guaiacol, one-sixth; crystallized terpen, one-third; benzoic acid, one-half; extract of belladonna and extract of

gelsemium, one sixty-fourth of a grain. In over five hundred patients this method has yielded good results. Not only in pulmonary tuberculosis but also in chronic bronchitis with fetid expectoration, in pulmonary gangrene, and in intestinal tuberculosis it is useful.—*Revue de Thérapeutique Médico-Chirurgicale*, 1900, No. 18, p. 622.

Artificial Serum-irrigations in the Treatment of Enteric Fever.—Dr. T. Baylac, inspired by the good results obtained in 1893 in the treatment of cholera, has extended the use of this method to enteric fever. Its advantage lies in its simplicity as compared with intravenous or subcutaneous injections, although in desperate conditions the intravenous method may be necessary. The amount of normal saline solution used is one quart, introduced through an irrigation tube each morning and night at a temperature of 59° F., and retained so long as is possible.—*Revue de Thérapeutique Médico-Chirurgicale*, 1900, No. 16, p. 554.

Normal Salt Solution in the Treatment of Hemorrhage in Typhoid Fever.—Dr. C. H. Andersen urges the intravenous injection of a quart of normal salt solution, the reservoir being elevated three feet, and the time required for the injection being twenty minutes. Five patients received transfusion, one several times for repeated hemorrhages, and all recovered.—*Medicine*, 1900, vol. vi., p. 710.

[The claim that this method is new is hardly tenable in view of the fact that to our knowledge it has been practised for nearly a score of years.—R. W. W.]

OBSTETRICS.

UNDER THE CHARGE OF

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Pitfalls in Diagnosis in Gynæcology.—Under this title MacNaughton Jones (*Edinburgh Medical Journal*, 1900, p. 570) describes a number of cases in which the diagnosis of the condition was very difficult. Among others he mentions those complicating pregnancy. Gynecologists have in many cases mistaken the pregnant uterus for a myomatous womb. He draws attention to the fact that a myoma which bleeds may occasion errors in diagnosis when the uterus endeavors to expel it; such a tumor has been considered a placenta prævia. He draws attention to mistakes in the diagnosis of ovarian cysts, where pregnancy with polyhydramnios or ectopic gestation has been mistaken for ovarian disease. Thus a patient was supposed to be in labor when the condition present was an ovarian cyst and beginning peritonitis.

He describes a case in which the patient was forty years of age, her last pregnancy having occurred twelve years previously. Menstruation had been irregular for some time, but had ceased for a few months before the patient was examined. Her general health had suffered, and the abdominal tumor was steadily increasing. Vaginal examination conveyed no impression of pregnancy. Fluctuation and a solid mass in the uterus were found. The patient was prepared for operation, and when anæsthetized the abdomen was again examined and fœtal heart sounds were heard and milk was found in the breasts. The fact that diseased conditions affecting the pelvic organs may undergo considerable change in a short time makes positive diagnosis difficult without repeated examinations. Thus, cystic tumors may rupture, a ureter may become blocked and a temporary hydronephrosis develop, a polypus may retract upon its pedicle within the uterus, while in some cases the polypus may escape a curette during operation.

[It is novel and interesting to hear from a gynecologist that these gentlemen are capable of mistakes. Some of them have so long posed as subsisting largely upon the incompetence and errors of obstetricians that it is a hopeful sign to find a gynecologist recognizing difficulties in diagnosis. We have recently had occasion in consultation to examine very thoroughly several patients in whom the question of pregnancy had to be considered. We know of no more severe test of thorough work in diagnosis than the positive recognition of a complicated pregnancy.—ED.]

Stump Pregnancy.—Under this title MORFIT describes the case of a patient who produced an abortion upon herself (*Medical News*, 1900, p. 869). This was followed by infection, and the tube and ovary upon one side were subsequently found infected and removed by abdominal section. The patient made a good recovery. Two years and four months after this she was again seen and found with the symptoms of shock and collapse from some intra-abdominal complication. She rallied sufficiently to be taken to a hospital, and the abdomen was again opened. When a mass of blood-clots had been turned out it was found that the oozing came from the stump of the old operation. The stump had ruptured and placental tissue presented upon it. Both tubes were entirely removed, and the patient made a complete recovery. She was, however, greatly prostrated, and rallied with great difficulty after the operation. The writer applies the name "stump pregnancy" because the pregnancy evidently occurred at the stump of the former operation.

Vulvar Hæmatoma.—In the *Scottish Medical and Surgical Journal*, 1900, p. 505, BALLANTYNE describes the case of a primipara, illegitimately pregnant, who was in labor. The membranes had ruptured a short time previously. When the second stage began the patient complained of a sharp pain on the left side of the vulva. A tumor shortly afterward began to form in the left labium. When the patient was seen she had lost much blood and was slightly œdematous under the eyes. The left labium was greatly swollen, containing a tumor, bluish-black in color, the size of a closed fist, which seemed almost ready to burst. On vaginal examination the head was found to be well engaged in the pelvic inlet.

The decision to deliver with forceps was reached, and the forceps were applied with considerable difficulty. The head was readily brought to the perineum. At this moment the tumor bulged into the fenestra of one of the blades and ruptured with a clean-cut tear. A huge mass of clot with some fluid blood was at once expelled. The child was immediately delivered; it was asphyxiated, but soon revived. It was not abnormally large, nor was its head abnormally hard and firm. The placenta and membranes were removed manually from the vagina, when it was found that the hemorrhage from the hæmatoma had almost ceased. The parts were carefully washed with bichloride of mercury solution, and the effort made to bring together the edges of the tear. It was found impossible to do so, and the labium was drained by a packing of iodoform gauze. Gauze was also placed in the vagina. The patient made a good recovery without complications.

The case is a typical one of this accident, without, in the present instance, any known cause. By some writers, chronic nephritis is supposed to be associated with the condition, but in the present instance nothing of the sort was present.

[As regards treatment, incision into the hæmatoma is sometimes practised and the blood-clot immediately turned out. This gives the advantage of a clean incision for the application of sutures. Usually, however, it is impossible to close the tissue by sutures, and gauze packing is the method of treatment employed.—ED.]

The Causation of Tubal Pregnancy.—In the *Archiv für Gynäkologie*, 1900, Band lx., Heft 3, GLITSCH contributes a paper in which he reviews his cases and also the literature of the subject. He concludes that no one factor can be alleged to be the constant cause of ectopic gestation. It must be known that a predisposition is certainly present, greatly influenced and modified by intercurrent affections. Inflammation of the tube and surrounding tissues is present in most of these cases. Other causes in comparison are infrequent. This inflammation results from the action of micro-organisms associated with tubercular, puerperal, or gonorrhœal processes. Of these, gonorrhœa is by far the most frequent cause.

The Treatment of Full-term Ectopic Gestation.—In the *American Journal of Obstetrics*, 1900, p. 740, CRAGIN discusses the question as to whether an effort should be made to save the life of an ectopic fœtus when viable He urges that the child's life should receive more consideration than it has in the past. He reports three cases, in one of which he delivered a living child, which survived, by abdominal section, and states his belief that by not attempting to remove the placenta at once, but by allowing it to be gradually discharged, it is possible to operate successfully in these cases, and, as this is the case, the life of the fœtus should not be sacrificed in ectopic gestation.

The Care of the Umbilicus.—RIECK (*Monatsschrift für Geburtshülfe und Gynäkologie*, 1900, Band xi., Heft 5) contributes a paper upon the treatment of the stump of the umbilical cord and the umbilicus. The principles which he strives to carry out are to make the cord as short as possible and to sterilize

it by the application of heat. This he accomplishes by applying a silk ligature close to the umbilicus and tying the cord firmly. This is a secondary ligature, as the cord is at first tied, as usual, some distance from the umbilicus when the child is removed from the mother. The stump of cord and umbilicus are then surrounded by wet cotton or a moist towel, and the stump of cord cauterized by the cautery or by a pair of crushing forceps heated in a gas flame. The cord sometimes burns rapidly, when caution must be taken that it be not cauterized too suddenly; and at other times the heat acts very gradually. The silk ligature is cut short and the very small stump remaining dressed with sterile cotton, linen, or gauze. Care is taken that a nurse or assistant holds the child firmly, so that it is not burned in any other portion of the body. The dressing is changed daily unless it adheres to the stump. It is then allowed to remain until the whole comes away. The umbilical dressing and bandage are usually not required after the tenth day.

[While this method might be applicable in hospitals, it would scarcely be employed in private houses. Among the many more simple ways of treating the cord, the use of alcohol upon sterile gauze has given us good results. The cord is first crushed and its Wharton's jelly as thoroughly expressed as possible. It is tied a short distance from the umbilicus and the stump wrapped in sterile gauze which has been thoroughly soaked in alcohol. It dries rapidly under this method and the umbilicus heals promptly.—ED.]

GYNECOLOGY.

UNDER THE CHARGE OF

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Ill Results Following Alexander's Operation.—MURATOW (*St. Petersburg med. Wochenschrift*, 1900, No. 5) reports five cases in which shortening of the round ligaments was followed by complications. Two patients who became pregnant aborted in consequence of the fact that the ligaments were so shortened that the uterus could not rise into the abdominal cavity; one patient died from septic infection. In two instances the ovaries were imprisoned between the uterus and the anterior abdominal wall. The writer does not deny the great value of the operation, but thinks that greater care should be observed in the choice of cases, especially in young women.

Calcium Carbide in Inoperable Carcinoma.—GRUSDEW (*Münchener med. Wochenschrift*, 1900, No. 24) speaks highly of calcium carbide, which he regards as the best application in cases of inoperable cancer of the cervix, especially those in which hemorrhage is the most prominent symptom. Although pain was considerably relieved, he did not obtain such marked beneficial results as were reported by other writers. As a deodorizer its effects rarely persisted beyond a week, when a second application was necessary. The

only unpleasant results which he observed were those due to caustic action of the lime on the vaginal walls and vulva, and these could be prevented by introducing pledgets of cotton-wool.

He recommends that the carbide be used previous to curetting and cauterizing the diseased tissue.

Origin of Unilocular Ovarian Cysts.—Von Kahlden (*Ziegler's Beitrage z. path. Anat.*, Bd. xxvii., Heft. 1) takes a new view of so-called hydrops folliculi, believing that the unilocular cysts usually regarded as simple retention follicular cysts really develop from included perineal epithelium. He thinks that the ova often found in these cysts represent both the product of degenerated epithelial cells and new cell-growths which spring from the lining membrane.

The question as to whether papillary cysts develop from ingrowths of ciliated epithelia he regards as still undecided.

Origin of Dermoid Cysts.—Arnsperger (*Virchow's Archiv.*, Band clvi.) reports three cases which he believes confirm Wilms' theory that dermoids of the ovary develop from the three embryonic layers.

Emmanuel (*Zeitschrift für Geb. u. Gynäkologie*, Band xlii.), from microscopical studies of a minute dermoid found in the centre of a small cyst of the ovary, arrived at the conclusion that it developed from an ovum, which was borne out by the fact that it contained cell elements from the three layers.

Conservative Treatment of Uterine Fibroids.—Olshausen (*Zeitschrift für Geb. u. Gynäkologie*, Band xliii., Heft 1), in reporting a case in which he enucleated a fibromyoma of the cervix, comments on the infrequency of conservative as compared with radical operations for this condition. He limits enucleation of multiple tumors to cases in which, if small growths must be left, the patient is so near the climacteric that there is no danger of their growing. He regards the danger as small, provided that the bed of the tumor is carefully sutured with tiers of catgut. Fourteen per cent. of his operations for myoma (207 in all) have been enucleations, with only one death.

Commenting on the diverse views regarding the necessity of operating upon uterine fibroids, the percentage of cases selected for operation varying from 14 to 41 per cent., according to the ideas held by different surgeons, the writer states that out of 30 cases in private practice seen during the last three years he had operated upon only 53, or 16.4 per cent., six other patients refusing operation. In his opinion, one who operates upon a larger proportion of his cases than this must underestimate the dangers of the operation, some of which—especially embolism and intestinal obstruction—are unavoidable.

[This conservative attitude assumed by such a prominent abdominal surgeon, whose clinical material is enormous in comparison with that of the ordinary operator, is in striking contrast to the radical views expressed by so many lesser authorities. Judging from many of our society discussions, one would infer that in this country the percentage of fibroids selected for

operation was often as high as 50 or 75 per cent. Indeed, we have heard it positively affirmed that every fibromyoma of the uterus which could be recognized at the examining table was to be regarded as practically an indication for operation. In spite of the improved statistics of hysteromyomectomy, we would do well to heed the warning that there will always be unavoidable deaths after the operation.—ED.]

Ultimate Results of Myoma Operations.—BURCKHARD (*Zeitschrift für Geb. u. Gynäkologie*, Band xliii., Heft 1) concludes an extended article on this subject as follows: The operator need not be deterred from leaving the cervix by any fear of its subsequent malignant degeneration.

With few exceptions the ultimate results are good, such psychical disturbances as follow being transient. After entire removal of the ovaries hemorrhage ceases, and the tumor ceases to grow; it usually diminishes.

Menstrual molimina are rarely noted after the removal of both ovaries; when one or both is left after extirpation of the uterus these may occur.

In short, since the patient's health is not injured, but, on the contrary, the usual nervous disturbances are sensibly diminished by leaving the healthy ovaries after removing the uterus, the writer believes that this should be done whenever it is possible.

Epithelial Ingrowths in the Myometrium.—MEYER (*Zeitschrift für Geb. u. Gynäkologie*, Band xliii., Heft 1) describes the microscopical appearances in sections made through seven uteri, which were extirpated on account of obstinate hemorrhages, which had not been relieved by frequent curettement and cauterization. In five nothing abnormal was noted to account for the bleeding except glandular processes which dipped down into the submucous muscular layer. The direct cause of the hemorrhages was inferred to be certain degenerative changes in the bloodvessels, which were more or less constant. The writer believes that the cell-processes were the result of local irritation, and that the hypertrophy of the muscle in this vicinity was sufficient to cause a marked increase in the blood-pressure.

If this supposition is correct, total extirpation is the only cure for such hemorrhage, and is fully justified in view of the tendency of these benign glandular in-growths to become malignant. The curette, however vigorously used, does not reach the seat of the trouble.

The positive diagnosis of this condition is seldom possible clinically, but it should be suspected when no improvement is noted after repeated curettings, while the microscope shows no evidence of malignant disease. On the contrary, it should not be forgotten that the hemorrhage may be due to a small polypus at the fundus or at the cornua.

[This paper is exceedingly suggestive in that it throws new light upon a class of cases which often cause the surgeon great anxiety, lest he may, on the one hand, advise a radical operation for a condition in which it is not justified, or, on the other hand, may counsel delay in a case of incipient carcinoma when early intervention is important. Doubtless the most conservative will agree with the writer, that the persistence of hemorrhage after repeated curetting, especially in a woman above forty years of age, amply justifies total extirpation.—ED.]

Kraurosis Vulvæ.—HELLER (*Zeitschrift für Geb. u. Gynäkologie*, Band xliii., Heft 1) concludes his study of a case by expressing the opinion that kraurosis is a chronic inflammatory process, in which no disease of the nerves can be demonstrated. It may be caused by irritants, especially chemical. Anatomically it is marked by disappearance of the fat and sebaceous glands in the deeper layers of the skin, while in the superficial layers hypertrophy of the tissues is noted, probably in consequence of the better nourishment of the subpapillary and suprapapillary cells.

DERMATOLOGY.

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The Parasitic Nature of Eczema.—SCHOLTZ and RAAB (*Annales de Dermatologie et de Syphiligraphie*, 1900, No. 4), in a bacteriological study of sixty cases of eczema representing the principal stages of the affection, found the staphylococcus pyogenes aureus almost constantly present. This micro-organism was not only found in the serum of moist eczemas and in the scales of the squamous forms, but had penetrated the tissues.

KREIBICH (*Ibid.*, 1900, No. 5) concludes from his researches that idiopathic, papulo-vesicular eczema, such as has been defined by Hebra, as well as the acute exacerbations in chronic eczema, appear independently of all microbic intervention. Nevertheless, after a longer or shorter time, the vesicles are invaded by pyogenic micro-organisms which provoke a rapid diapedesis, and transform the serous vesicles into pustules. Attempts to produce acute eczema either by the inoculation of serum from oozing eczematous surfaces, or of cultures of the microbes met with in suppurating vesicles, were unsuccessful.

VEILLON (*Ibid.*, 1900, No. 6) concludes that the existence of a specific parasite of eczema is not yet demonstrated. The pure, primitive lesions of true eczema do not contain any microbe discoverable by any of the present methods known to bacteriology. The various microbes, in particular the staphylococcus, which grow abundantly in the open vesicles or on the oozing or crusted surface of eczema, are secondary infections whose direct rôle is not yet elucidated, but which are the cause of most of the complications of eczema, such as furuncle, abscess, folliculitis, etc.

The Visceral Lesions of the Erythema Group.—OSLER (*British Journal of Dermatology*, July, 1900) adds to the series of cases published in 1895 a new series of seven cases of various forms of the erythemata accompanied by visceral lesions, preceded by the subsequent history of one of the cases of the

first series. The visceral manifestations accompanying the cutaneous eruption consisted of: (*a*) Gastro-intestinal crises characterized by colic, colic and diarrhœa with vomiting, hæmatemesis, or bloody stools; (*b*) hæmaturia and nephritis, six cases out of eighteen; (*c*) hemorrhages from the bowels, the nose, the gums, the stomach, and the kidneys (not associated with nephritis); (*d*) cerebral symptoms pointing to involvement of the brain; (*e*) and lastly, pulmonary symptoms. The skin lesions were purpura, urticaria, either alone or associated with purpura, acute circumscribed œdema, and typical erythema multiforme. The inconstancy of the character of the skin lesions was a prominent feature. In more than half the cases swelling of the joints, of the synovial sheaths, or of the periarticular tissues occurred. The author believes that a close affinity between exudative erythema, Henoch's purpura, peliosis rheumatica, urticaria, and angio-neurotic œdema, is shown by the similarity of conditions under which they occur; by the identity of the visceral manifestations, and by the substitution of these affections for each other in the same patient at different times. The cases reported are difficult to group etiologically. In some a relationship with migraine was suggested. In one case the cause was probably to be found in the products of gastric fermentation taking place in a dilated stomach. Some of the cases were probably of rheumatic origin, although the presence of arthritis does not necessarily indicate the presence of the rheumatic poison.

The Transmissibility of Animal Scabies to Man.—ALEXANDER (*Archiv für Dermatologie und Syphilis*, Bd. lii., Heft 2) reports three cases of scabies, two in children and one in a woman, contracted through contact with domestic animals; and concludes, from an examination of the literature of the subject and his own experience, that the itch of domestic animals—and of wild animals also when these come in contact with man—so far as it is produced by a sarcoptes, is transmissible to man. It usually runs a mild course, lasting not more than six to eight weeks, and is readily influenced by antiparasitic remedies. In the clinical picture of the disease it is worthy of remark that the localities affected by preference in human scabies are usually exempt, while, on the other hand, the eruption does not show predilection for any particular region. Typical burrows, are, as a rule, wanting, and the demonstration of the mite is difficult.

Psoriasis Vulgaris in the Infant.—J. H. RILLE (*Journ. des Mal. Cut. et Syph.*, July, 1899) reports a case in which this disease occurred in an infant five days old, and calls attention to the fact that psoriasis in children often follows one or another of the acute eruptive fevers, and also vaccination. Cases in which the disease occurred early in life have been reported by Billard (three months), Zeissl (eight months), and Neumann (four months).

Molluscum Contagiosum of the Sole of the Foot.—BALZER and ALQUIER (*Annales de Dermatologie et de Syphiligraphie*, 1900, No. 4) recently reported the following case to the Société Française de Dermatologie et de Syphiligraphie: A boy, fifteen years of age, had had a small tumor on the sole of the foot for seven or eight months which gave him much pain in walking, and which continued to increase in size slowly, notwithstanding various forms

of treatment, including two curettings. The tumor was somewhat papillomatous in appearance, of firm consistence, and painful on pressure. As it continued to grow, and all other forms of treatment had failed, it was excised. Microscopical examination of the excised tumor revealed the structure of molluscum contagiosum. No other tumors were found upon the body.

The Treatment of Epithelioma of the Skin with Concentrated Light.—FINSEN (*Dermatologische Zeitschrift*, Bd. vii., Heft 3) at a recent séance of the Danish Dermatological Society reported the results obtained in the treatment of epithelioma with concentrated light. In three out of sixteen cases the treatment appeared to be without result; in four improvement took place, but no cure; in the remaining nine there was an apparent cure, one of these having been under observation two and a quarter years. In these cases the treatment proved itself so entirely favorable and active as to justify the assumption that repeated treatment can eventually produce an actual cure. The light treatment is only adapted to those cases in which the lesion is superficial and well-limited, and situated so as to be easily accessible.

Local Applications of Guaiacol in Lupus.—LEPLAT (*Annales de Dermatologie et de Syphiligraphie*, 1900, No. 6) at a séance of the Anatomo-clinical Society of Lille reported two cases of lupus of the face accompanied by extensive ulceration, treated by curettement and painting twice daily with a solution of guaiacol in glycerin, equal parts In the first case the lesions were completely healed in the space of one month, in the second in four months. After some months there had been no recurrence.

Naftalan in Diseases of the Skin.—HALLOPEAU (*Annales de Dermatologie et de Syphiligraphie*, 1900, No. 5), who has been experimenting with this substance in his service, finds that it is devoid of irritating properties, and may, consequently, be employed in acute cases. It exerts a remarkable influence upon pruritus; and in the seborrhœic eczemas of children it produces a more rapid improvement than other forms of treatment. In the eczema of adults its use has likewise been followed by very favorable effects. In a case of the prurigo of Hebra naftalan gave remarkable results, producing almost instantly cessation of the itching and disappearance of the eruption. In a few cases, on the other hand, the results were not so favorable.

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